

AI AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING

Civilian and Defense

APRIL 15, 1951

In This Issue . . .

Vehicles of Russia and Her Satellites

New Concepts for Defense Tooling

Geneva International Automobile Salon

Aircraft Optical Tooling System

Analysis of Grand Canyon Economy Run

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A C H I L T O N P U B L I C A T I O N

cylinder head production

GETS A

LIFT

with this new

DOUBLE-SLIDE Heald Bore-Matic

In the boring of cylinder heads, holes are sometimes too closely spaced to permit the use of a cluster-head arrangement. In such cases the part must either be borized in separate setups—or with vertical as well as lateral indexing.

Confronted with this problem, an automotive manufacturer called in his Heald representative. The result—cylinder head production was materially increased, by the use of a new Heald Model 321 Bore-Matic, with the time-saving, double-slide arrangement shown below.

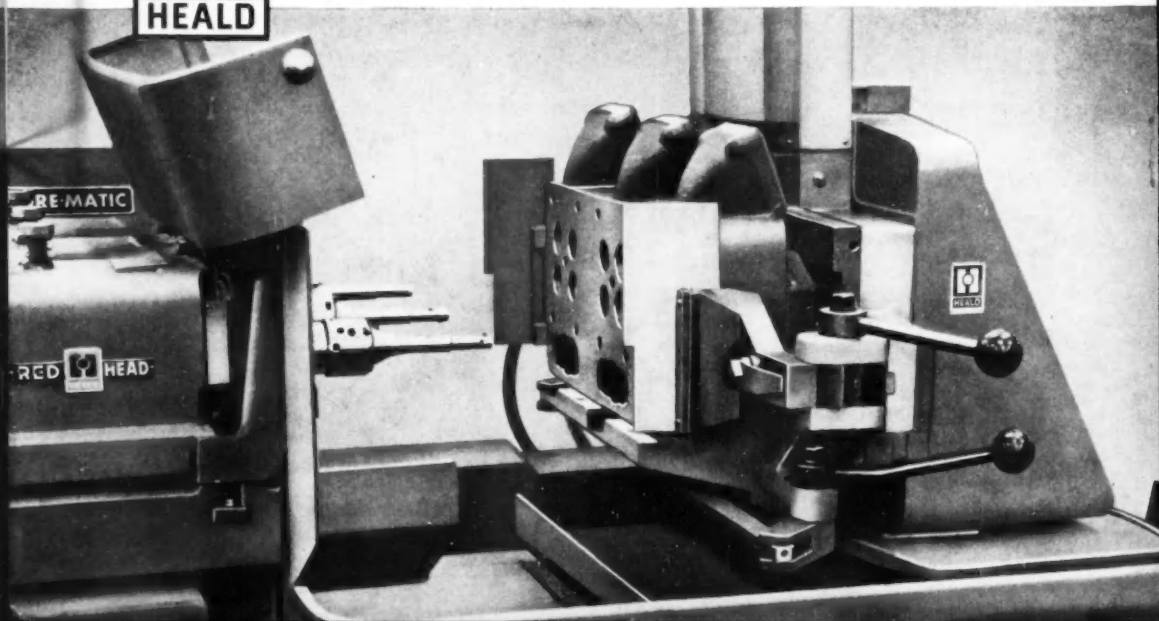
Three holes are bored, counterbored and chamfered in each of four operations. After the first set of holes has been completed, the vertical slide is indexed by push-button, and the second set is borized. The cross slide is then indexed and the next two sets of holes (upper and lower level) are borized in the same sequence. Quick-change quills permit borizing of two different size holes, for exhaust and intake.

Remember—when it comes to precision finishing, it pays to come to Heald.

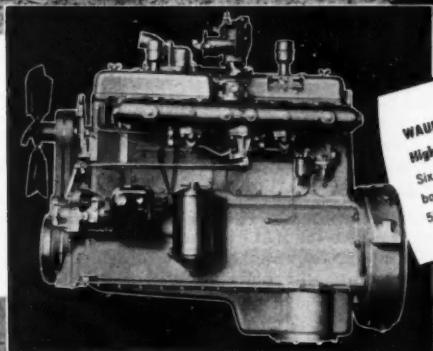


THE HEALD MACHINE COMPANY **WORCESTER 6, MASSACHUSETTS**

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the bigger they are ...the faster they haul



**WAUKESHA 140-GZB
High Output ENGINE**
Six cylinders, 4 1/8-in.
bore x 5 1/2-in. stroke,
554 cu. in. displ.

● Extra power with extra speed!

It's this combination, in a power plant that's both rugged and reliable, that keeps Kenworth Trucks traveling fast—over access roads as well as along the highways—no matter how big the sticks, or how heavy and hard the hauling.

It develops 188 hp at 2600 rpm on 75 octane gasoline—this Waukesha 140-GZB High Output Engine. Valve-in-head type... with 7-bearing hardened crankshaft counter-balanced and vibration dampened... removable, hardened wet sleeve cylinders... Stellite-faced exhaust valves and exhaust valve inserts... full floating piston pins... full pressure oiling by positive gear-type pump... thermostat by-pass for quick warm-up... Waukesha built-in governor. Arranged for full electrical equipment and all modern accessories. Get Bulletin 1484.

WAUKESHA MOTOR COMPANY
WAUKESHA, WISCONSIN

NEW YORK TULSA LOS ANGELES

112

WAUKESHA ENGINES

"K" MONEL and "KR" MONEL

Age-hardenable, non-magnetic alloys offering high strength, excellent corrosion-resistance and good working properties

Where stressed structural members must be placed close to sensitive electro-magnetic equipment, or where extra strength is needed in corrosive environments, these Inco Nickel Alloys offer solutions to the problems of metal selection.

Both alloys show *improved* strength and hardness at sub-zero temperatures. And both alloys provide moderate strength at temperatures to 900°F.

"K"® Monel and "KR"® Monel are similar in composition and properties. "KR" Monel has better machinability and is recommended for parts requiring intricate machining.

The principal engineering characteristics of these alloys are:

Tensile Properties: "K" Monel in the fully age-hardened condition has a minimum yield strength (0.2% offset) of 100,000 psi and a tensile strength of over 140,000 psi, with minimum elongations (in 2 in.) of 15% and 20% for cold-drawn and hot-rolled materials respectively. "KR" Monel, age-hardened, has a minimum yield strength (0.2% offset) of 90,000 psi with minimum elongation of 20% (in 2 in.) for as-rolled material.

Shear Strength: The shear strength of "K" Monel, as determined with .050-in. x .250-in. specimens subjected to double shear, is (full hard, age-hardened) 98,450 psi maximum, with 0.04 in. deflection. The shear strength of "K" Monel rivets, fully age-hardened, is 89,200 psi with ultimate tensile strength of 147,000 psi.

Spring Properties: "K" Monel wire can be cold-drawn and age-hardened to develop 160,000 to 200,000 psi tensile strength. The torsional proportional limit of cold-drawn, age-hardened wire is about 40% of the ultimate tensile strength.

Endurance Limit: In rotating beam tests of polished speci-

mens at room temperature and 10,000 r.p.m., "K" Monel (cold-drawn, age-hardened) showed an endurance limit for 10⁶ cycles of 41,000 to 59,000 psi.

Magnetic Characteristics: "K" and "KR" are non-magnetic under ordinary conditions and remain so at sub-zero temperatures.

Working Characteristics: Both "K" Monel and "KR" Monel may be hot-worked, forged, and cold-worked. "K" Monel may be readily machined in the annealed condition and may be considered commercially machinable at practical rates in other conditions with Brinell hardness of up to 275. "KR" Monel, because of higher carbon content and special thermal treatment, has better machinability than "K" Monel and is recommended for parts requiring more intricate machining. Because of greater hardness, both alloys will take a higher polish than Monel. Both may be joined by the usual welding, brazing, and soldering processes.

Corrosion Resistance: These alloys are highly resistant to attack by most commonly-encountered corrosives, including mineral and organic acids, alkalis, salts, potable and industrial waters, foods, organic compounds, and oxidizing atmospheres at normal and elevated temperatures.

Forms Produced: "K" Monel is supplied in most commonly-used mill forms—rods, hexagons, squares, flats, strip, sheet, seamless tubing, wire, welding materials—and in a variety of finishes and conditions. "KR" Monel is produced in rods, hexagons, squares, hot-rolled and cold-drawn.

Applications: Because these alloys retain their non-magnetic, corrosion-resistant, and high physical qualities at abnormal temperatures, they have been used to advantage in aviation instruments, roller chains for retractable landing gear, controls, springs and contact arms in electrical equipment, in stressed structural members and fastenings.

"K" MONEL
Effect of temperature on physical properties
(Age-hardened condition)

Test Temperature °F.	Yield Strength (0.2% offset) psi.	Tensile Strength psi.	Elongation in 2 in. per cent	Crop Strength (0.10% in 10,000 hr.) psi.	Hardness (Brinell)	Impact (Charpy) ft.-lb.
-300	160,200	202,000	27	...	...	...
-110	134,600	171,550	17.3	...	36 (Rock. C)	27
Room	111,000	160,000	23.5	...	331	27
200	108,000	150,000	23.5	...	...	...
400	103,000	149,000	24	...	...	...
600	105,000	146,000	23	...	...	...
750	...	...	...	67,000	...	...
800	105,000	124,000	8.5	48,000	302	...
1000	92,000	95,000	3	8,500	255	...
1100	...	...	...	...	229	...
1200	80,000	80,000	1.5	...	...	...
1400	30,000	45,000	8	...	...	...

FURTHER DATA AVAILABLE

A 23-page reference manual, *Engineering Properties of "K" Monel and "KR" Monel*, contains all essential engineering information on these alloys. It is available, free, for your files.

Nickel alloys are being increasingly diverted to defense applications. However, technical help for metal problems involving corrosion, high temperatures or fatigue is available from INCO's Technical Service, either for immediate defense needs or for future installations.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE
NICKEL INCO ALLOYS
TRADE MARK

AUTOMOTIVE INDUSTRIES

April 15, 1951

Published Semi-Monthly

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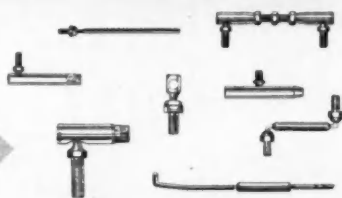
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AUTOMOTIVE INDUSTRIES, April 15, 1951

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BALL JOINTS, PIPE PLUGS
AND QUALITY
SCREW MACHINE PRODUCTS

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• The use of Tourek Ball Joints—the only recognized standard—frequently brings about simplified design, improved performance and lower costs. A wide range of standard types is carried in stock to assure prompt delivery.



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"THE BEST IN QUALITY SCREW MACHINE PRODUCTS"



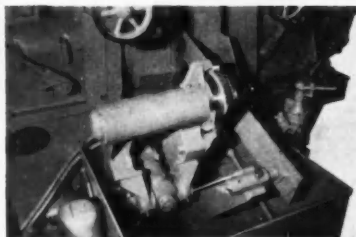
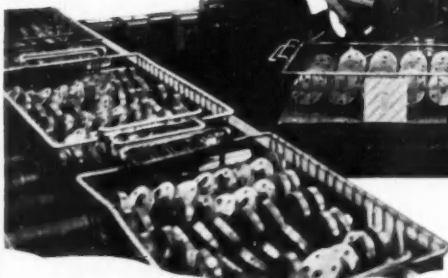
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More Production—*Yes...*

a Better Finish—*Too...*

with **BESLY GRINDERS!**

No. 226 — 23" Besly Double Spindle Wet Grinder equipped with hydraulically-oscillated indexing type fixture and hydraulic infeed on the spindles



Hydraulically-oscillated indexing-type fixture — with hydraulic infeed on the spindles — is adjustable to change rate of oscillations.



Diameter of end plates is $3\frac{1}{2}$ " x .561" thick — practically a solid area.

Case Facts on This Grinding Operation

Work is held to .00005" for flatness... and parallel to within .0003" — with a surface finish of 10 micro-inches or better.

Uniform flatness of work as it comes from the grinder eliminates necessity for a subsequent lapping operation.

Parts come to the grinder with .002-.003" overall stock for final grind. Production is 180 finished pieces per hour — a total of 360 surfaces.

Grinder is equipped with a filter unit to remove all foreign matter from the coolant.

In grinding cast iron cylinder end plates for NORGE REFRIGERATORS, this Besly Grinder turns out more finished pieces per hour than any equipment used previously. At the same time, the work is finished so accurately that a subsequent lapping operation has been eliminated. Such outstanding performance pays off in lower production costs for an improved product.

Whatever your product — if precision-ground surfaces are essential — Besly may be able to point out how increased production can be achieved at lower unit cost. Consultation with a Besly engineer does not obligate you.

BESLY-TITAN WHEELS! Ask for a copy of this new Besly-Titan booklet of abrasive wheels and discs — a valuable source of information on modern grinding abrasives — up-to-date — authoritative. Write for your copy today!

WRITE TODAY!



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BESLY-TITAN ABRASIVE WHEELS — individually formulated for your job.

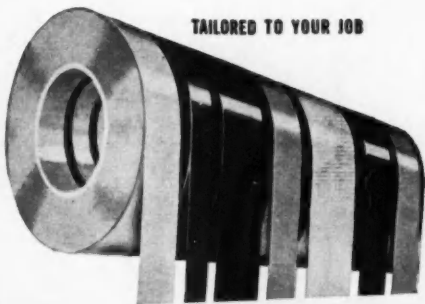
GRINDERS — your — reduce costs on every TYPE of surface grinding.

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AUTOMOTIVE INDUSTRIES, April 15, 1951

THE NEW
Polyken®
INDUSTRIAL TAPES

TAILORED TO YOUR JOB



Here, prior to its molten rubber bath, Polyken Tape No. 188 is vulcanized to automotive door liner and window channel stripping to form a permanent butt joint.

No "ifs" or "ands" about these butts

Butt-splicing is just one of the jobs that the automotive industry is finding for the new Polyken Industrial Tape, No. 188. But it's a tough job and it demonstrates the bull-dog tenacity of this amazing tape. Come hot, cold, moisture, or even a bath in molten rubber, No. 188 *sticks* and stays stuck.

Take the case of Schlegel Manufacturing Company. They needed a tape for butt-splicing together 100-yard lengths of woven material, to be coated with hot rubber for automotive door liners and window channel stripping. Ordinary tapes were too bulky, and wouldn't stay stuck during the hot rubber treatment.

Polyken engineers suggested they test the new

No. 188 . . . and they've been using it ever since! Although it's only 11.5 mils thick, Polyken No. 188 has a tensile strength of 50 pounds per square inch. Its special thermo-setting adhesive actually holds tighter under extremes of heat! Sticks to any surface as well as its own, and easily conforms to rough and irregular shapes.

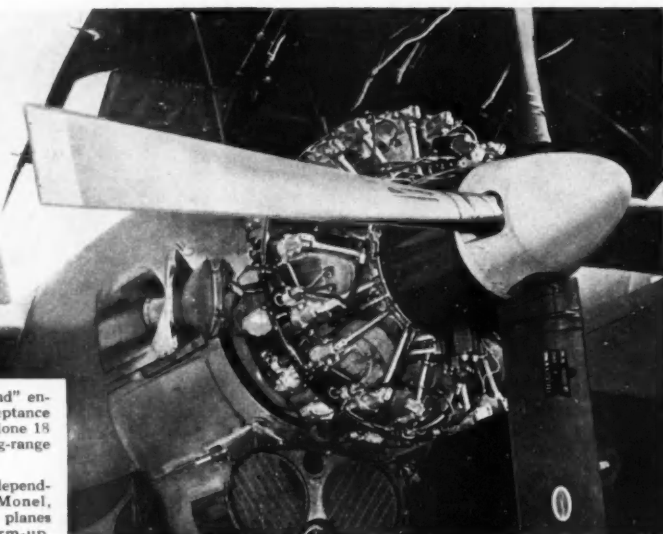
FREE SAMPLES. Write now for complete specification and engineering data, plus samples of Polyken No. 188. Address Polyken, Dept. A11D, 222 West Adams Street, Chicago 6, Illinois.

Polyken Industrial Tape, Department of Bauer & Black, Division of The Kendall Company



FIRST aircraft "compound" engine to pass military acceptance test, Wright Turbo-Cyclone 18 now powers two long-range anti-submarine planes.

← LEFT: Primer lines of dependable Bundyweld, in Monel, help many types of planes take off without warm-up.



Bundyweld — right tubing for new Wright aircraft engine (and others, too)

The new 3250 horsepower Wright Turbo-Cyclone engine gets off to a flying start with the help of Bundyweld (Monel) primer lines—just one of many exacting new defense uses in which Bundyweld, the top automotive tubing, also excels.

Bundyweld's advantages in almost any small-diameter tubing application stem from its patented construction. It's double-walled from a single strip of Monel, nickel, or steel—with an exclusive beveled edge. It's copper-brazed through 360° of wall contact. Bundyweld's double walls are thinner walls—lightweight, yet amazingly strong. It em-

bodies exceptional fatigue strength, withstands more pressure, is leakproof, too.

Bundyweld bends easily, takes more bending without structural collapse or weakening. Its close tolerances and freedom from scale assure smoother production, save time and money. And our engineers stand ready to unspool your knotty bending problems. We'll produce your parts, too, ready and right for your assembly line.

Whatever your needs, you'll find we bend over backward to answer them. Write: **Bundy Tubing Company, Detroit 14, Michigan.**



Bundyweld Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

WHY BUNDYWELD IS BETTER TUBING



Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . .



continuously rolled twice around laterally into a tube of uniform thickness, and



passed through a furnace. Bending metal fuses with basic metal, presto—



Bundyweld . . . double-walled and brazed through 360° of wall contact.



SIZES UP TO 1/2" O.D.

NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • Chattanooga 2, Tenn.: Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • Chicago 32, Ill.: Lapham-Hickey Co., 3333 W. 47th Place • Elizabeth, New Jersey: A. B. Murray Co., Inc., Post Office Box 476 • Philadelphia 3, Penn.: Rulon & Co., 1717 Sanson St. • San Francisco 10, Calif.: Pacific Metals Co., Ltd., 3100 19th St. • Seattle 4, Wash.: Eagle Metals Co., 4755 First Ave. South Toronto 5, Ontario, Canada: Alloy Metal Sales, Ltd., 881 Bay St. • Bundyweld nickel and Monel tubing is sold by distributors of nickel and nickel alloys in principal cities.

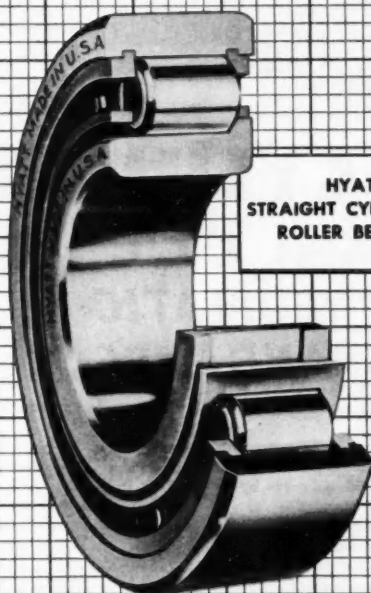
Preferred for their precision

Hyatt Hy-Load Roller Bearings are straight cylindrical bearings available in a wide range of types and sizes and with a number of different snap ring, separator, and race flange arrangements to meet a variety of application requirements.

Hyatt Spherangular Roller Bearings are self-aligning angular contact bearings designed to take both radial and thrust loads. They provide ideal distribution of load on

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The correctness of Hyatt design has been proven by the performance of the millions of precision-manufactured Hyatts operating year after year in cars, trucks and buses the world over . . . justifying the automotive engineers' preference for these dependable bearings. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey and Detroit, Michigan.



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STRAIGHT CYLINDRICAL
ROLLER BEARING



HYATT
SPHERANGULAR TYPE
ROLLER BEARING

HYATT ROLLER BEARINGS

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HEADS, CAPS
and MOUNTINGS
MACHINED from
SOLID BAR
STOCK**

**HARD
CHROME PLATED
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RODS**

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BRASS BARRELS**

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"DOWNTIME"**
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MILLER MOTOR COMPANY

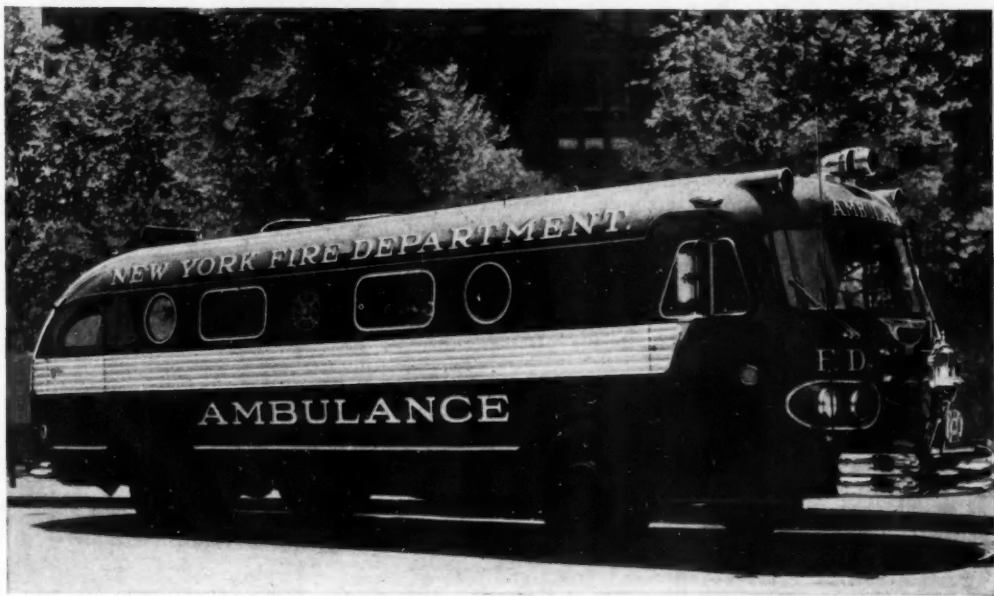
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Sales and Service from coast to coast

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ROSS BRINGS EASE . . . AND ECONOMY

Cam & Lever **STEERING**

CAREFUL PLANNING and proper preventive action are the *best safeguards* against disaster. FLXIBLE's new ambulance-coach for New York City's fire department features oxygen equipment, medical supplies, capacity for eight stretcher patients, hot and cold running water . . . and the *finest in steering*—ROSS.

The Ross policy of incorporating advancements in design as they are proved by exhaustive tests has resulted in many recent improvements. Current Ross models have:

- (1) Increased mechanical reduction . . . (2) More compactness . . . (3) Reduction in weight . . .
- (4) Greater arm angular-travel . . . (5) Improved metallurgy . . . (6) Increased efficiency.

Throughout 44 years of leadership in this industry, Ross gears have been distinguished for long life, simplicity of adjustment and maintenance of long-recognized qualities of safety, stability and performance. We invite discussion of any steering problem.

ROSS GEAR AND TOOL COMPANY • LAFAYETTE, INDIANA

AUTOMOTIVE INDUSTRIES, April 15, 1951

insist on "buried" integrity in your products

In the durable goods field most of the products are composed of many component parts. Acadia Synthetic Rubbers are contributing importantly to the superiority of thousands upon thousands of these products on land, sea, and in the air—from battleships to tiny instruments. For years manufacturers in hundreds of industries have found by experience that, with Acadia Synthetic Rubber parts in their products, they will never have trouble from that source. Acadia is a "buried" but vital component for products of highest integrity. Insist upon it!



• for every synthetic
rubber requirement



- sheets
- tubing
- strips
- channel
- washers
- seals
- bellows
- gaskets
- rings
- extrusions
- cut parts

Resists oil,
age, wear,
heat, light



ACADIA

Processors of Synthetic Rubber
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Synthetic PRODUCTS

DIVISION WESTERN FELT WORKS • 4035-4117 OGDEN AVENUE, CHICAGO 23, ILLINOIS

Another First for...

N·A·X
ALLOY STEELS

The use of N-A-X ALLOY STEEL in Aircraft Gas Turbines saves up to 50 per cent of critical Stainless Steel.

**Conservation is possible — without sacrifice
with use of N-A-X ALLOY STEELS**

With the demand for greatly increased quantities of the critical and strategic Stainless Steels used in Jet Engines intensified by the acceleration of the building program, the Air Force requested the producers of these engines to seek *suitable* material with less critical alloy content to replace the Stainless Steel for certain moderate temperature application in these aircraft gas turbines.

The steel selected had to be of low-alloy content with high strength and good welding characteristics. Ordinary low carbon steel did not meet the requirements because of its low tensile properties and the fact that it could not be satisfactorily welded by the inert arc process, which is widely used in aircraft gas turbine manufacture.

The data available from tests made on several weldable low-alloy, high-strength steels indicated that N-A-X ALLOY STEEL was the most satisfactory of the group — *its selection followed*. Unlike other possible substitutes, N-A-X ALLOY STEEL has good low temperature impact values, maintains its higher strength and is not subject to temper brittleness in the wide operating temperature range required of the steel for this purpose — from a low of -70°F. to $+800^{\circ}\text{F.}$

The use of N-A-X ALLOY STEEL for this application has cut the amount of Stainless Steel required in half. This is of considerable importance to the Air Force.

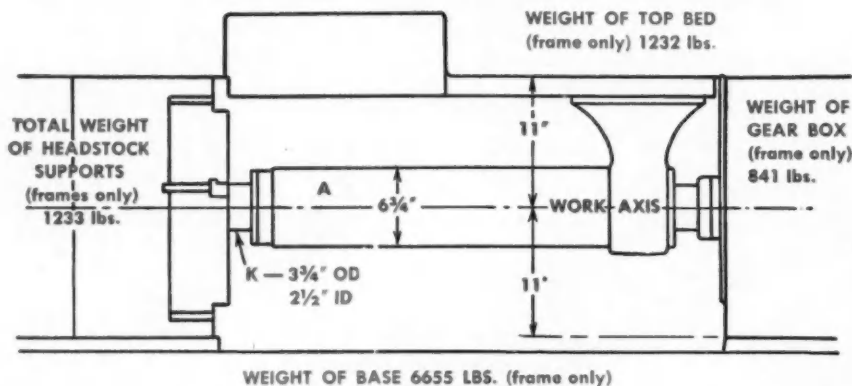
GREAT LAKES STEEL CORPORATION

N-A-X Alloy Division

Ecorse, Detroit 29, Michigan

NATIONAL STEEL CORPORATION





MAKER OF "HISTORIES"

The above drawing illustrates a Tooling Area that has staged many outstanding cases of machine adaptation and performance. Case histories are very useful as examples of machine adaptation, but their blanket use as unqualified proof of dependable performance is not convincing.

Buyers know that varying requirements and conditions of various plants make "buying what the other fellow buys" an unsafe practice. They know that good case histories will result if machine facilities have been properly selected. No plant could long afford to have it otherwise.

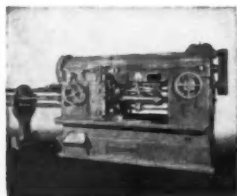
A "top performer" of the 1 1/2" SIX SPINDLE CONOMATIC TOOLING AREA, shown above, is the MAIN END SLIDE. The specific data given tells why:

1. It has a greater maximum load recommendation and a stronger frame support than the main end slide of any other "automatic".

The 272 lb. alloy carburized steel Main End Slide, A, is 33 5/8" long, and has a maximum load recommendation of 4800 ft. lbs. Its round surface is machined to close limits. It is supported in nickel iron, split, sleeves on the alloy steel Way, K, with a total bearing of 136.9 sq. ins.

2. It handles more work; has more adaptable tooling positions, and more selective feeds, than the main end slide of any other "automatic".

The 27 3/8" tooling-length of the Slide handles shaft jobs up to 18" in length. The 2 5/8" swing clearance permits die-head threading to full machine capacity in any, or all, six positions without Slide alteration. Nine pairs of pick-off gears give 68 feed changes for each work spindle speed.



Buyer's Comparison Chart will guide you to full information

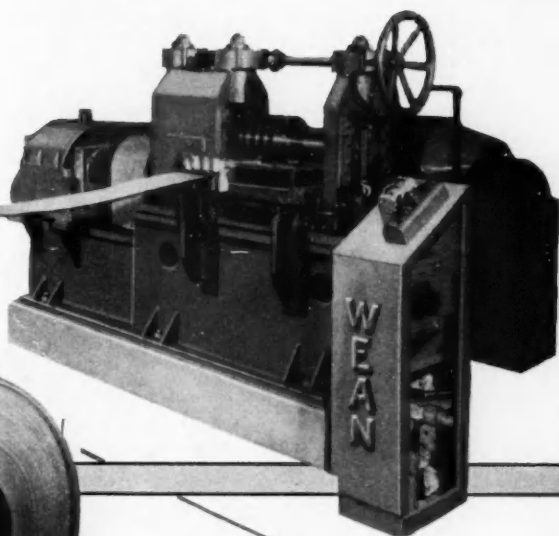
A Comparison of ALL Automatics is in Favor of Cone



Conomatic

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Wean offers you



GENERAL DUTY SLITTING LINES

WITH SPEEDS UP TO 800 FPM

AT LOW INITIAL COSTS

PLUS FEATURES THAT ENABLE YOU TO

- | | |
|-----------------------|-------------------------------|
| 1. Reduce Inventories | 3. Eliminate Extras |
| 2. Cut Labor Costs | 4. Minimize Maintenance Costs |

If you are in the business of handling strip steel or fabricating steel parts or products from strip steel you should give your slitting operation high consideration. Well designed slitting lines enable you to reduce inventories, lower labor costs and eliminate extras. Wean engineered slitting lines give you these important factors of lowest initial costs.

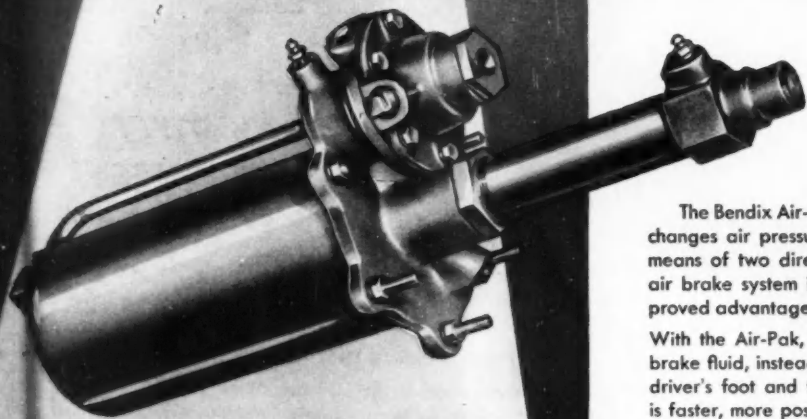
If you have a slitting problem — or merely desire a check on the efficiency of your present operation — call in Wean specialists.

Wean

Equipment Corporation
CLEVELAND, OHIO

Bendix AIR-PAK

An Air Brake Unit that Revolutionizes Heavy Vehicle Braking!



The Bendix Air-Pak is an air-hydraulic unit that changes air pressure into hydraulic pressure by means of two direct connected pistons. Thus an air brake system is combined with all the well-proved advantages of hydraulic brake actuation.

With the Air-Pak, a non-compressible column of brake fluid, instead of air, connects between the driver's foot and the brake shoes. Brake action is faster, more positive and under better control. Also, brakes can be applied instantly by foot-power alone—a valuable emergency stand-by if brakes are needed before air pressure builds up, or if air pressure fails for any reason.

The Air-Pak is similar in design and principle to the well known Bendix* Hydrovac*, vacuum-hydraulic braking unit, in use today on more commercial vehicles than any other power braking system. Bendix has built more than 2½ million Hydrovacs; thus the Air-Pak has a matchless background of related engineering and manufacturing experience.

A descriptive folder on Air-Pak will be sent on request.

*REG. U. S. PAT. OFF.

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Bendix Products Division

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High Spots of This Issue

The BUSINESS PULSE

Called the Business Pulse, another new department is added to the pages of AUTOMOTIVE INDUSTRIES with this issue. The Business Pulse, appearing monthly, will serve as a sort of "editorial calipers," taking in hand, measuring and analyzing the cycle and flow of events in the economic life of the Nation. Exclusively prepared by the Guaranty Trust Co. of New York, its first "beat" begins on page 50.

★ Vehicles of Russia and Her Satellites

Written from Leipzig, Soviet Zone, Germany, this account describes interesting cars and trucks of Eastern Germany displayed at the Leipzig Fair, and manufactured under the aegis of the IFA, the state-owned motor-manufacturing enterprise. Three makes of Soviet cars are also described—the Pobeda, Zim, and Zis, and two Czechoslovakian makes—the Skoda and Tatra. Page 32.

★ New Concepts for Defense Tooling

Well over \$1 million is being invested by the Air Force in direct financing of straight-forward investigations in aircraft tooling. Lt. General Kenneth B. Wolfe describes some of the outstandingly difficult specifications called for and cites the urgency of a sound tooling program in event of any major mobilization effort. Page 37.

★ Optical Airframe Tooling System

A new assembly technique is in use at Republic Aviation. Bolted castings replace welded construction, lowering costs and permitting quick assembly and reassembly. This optical system, including telescope and collimator, increases accuracy and avoids dependence on master fixtures. Page 38.

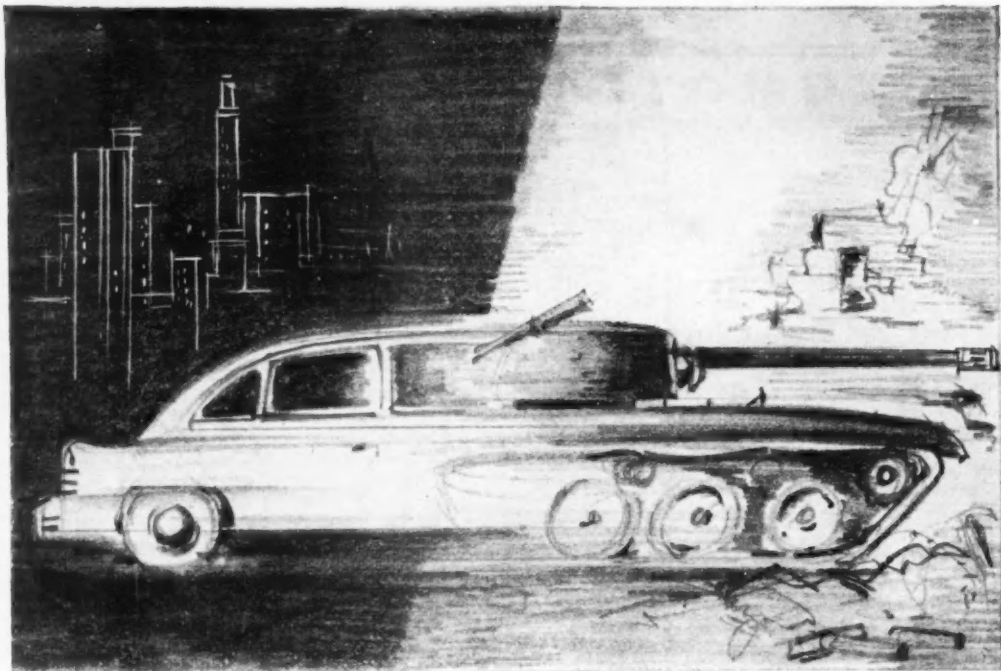
★ 1951 International Auto Salon

One of the largest ever held, this Swiss show at Geneva found every European nation represented. As well, many exhibitors from the U. S. were entered. Our European correspondent takes you through it. Page 42.

★ 17 New Product Items And Other High Spots, Such As:

Defense again the No. 1 job; tool engineers stress engineering know-how at annual meeting; the many production problems created by metals shortages; the McCulloch tandem-rotor helicopter; and contour forming parts for a jet engine.

*News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3*



Helping You Shift TO DEFENSE PRODUCTION

Practical solutions to the complex problems that accompany the switch to defense work can often be found at your nearby Ryerson Plant. Experienced Ryerson steel men will gladly work with you. Not only can they help you select the right steels for the job at hand, but they are well-informed on military specifications and the latest government procedures.

When you want steel quickly for building experimental or pilot models—for bridging the gap between initial and full-scale production, we suggest you check with Ryerson. Though kinds and sizes most in demand are not always available for prompt shipment, we do have a large tonnage of steel on hand at thirteen strategically located plants.

So call us for steel—and steel information. We can't promise to fill all your steel requirements, but we can assure you that we will do our very best to help.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled and cold finished

STRUCTURALS—Channels, angles, beams, etc.

PLATES—Many types including Inland 4-Way Safety Plate

SHEETS—Hot and cold rolled, many types and coatings

TUBING—Seamless and welded, mechanical and boiler tubes

ALLOYS—Hot rolled, cold finished, heat treated

STAINLESS—Allegheny bars, plates, sheets, tubes, etc.

REINFORCING—Bars and accessories, spirals, wire mesh

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RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

News of the AUTOMOTIVE INDUSTRIES

Vol. 104, No. 8

April 15, 1951

Cadillac Drops Model to Save Materials

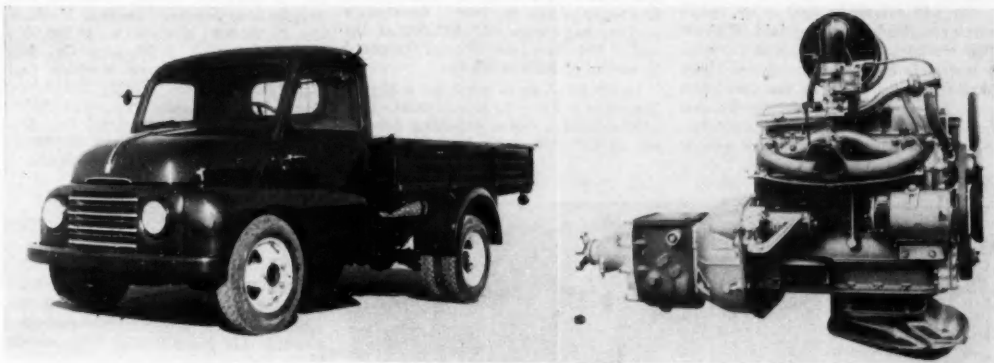
Cadillac has started to reduce production of its 61 model and it soon will be temporarily out of the line. The model is not being permanently discontinued, but will be reinstated if and when supplies of materials improve. Suspension of the '61 simplifies the line and saves critical materials. Currently the demand for the 62 is about four times greater than for the 61.

still not on a production basis, but should step up rapidly and the plant should be in high production this summer. The tank weighs 25.8 tons and can be transported by air. It is equipped with a Continental air-cooled engine, but horsepower has not been revealed. The tank is equipped with a high velocity 76-mm gun which is kept on the target over the roughest terrain through a secret fire control mechanism. More than 1400 subcontractors, of which one-half employ less than 500 em-

Mich., just west of Detroit. The company has acquired 157 acres there and will put up a plant with more than 1.5 million sq ft of floor space. Ford was recently granted a contract to build medium tanks, with the order estimated at about \$195 million.

See Dip in Car Output in Second Quarter

That passenger car production this quarter will be below the record production of 1.6 million units turned out



FIAT'S NEW TRUCK

The Fiat Co. of Turin has placed on the Italian market this new Fiat 615 light 1½ ton truck. Powered by a four-cyl gasoline engine (right), with a piston displacement of about 85 cu in.,

developing 39 hp, it has a maximum speed of about 46 mph. The overall length of the vehicle is about 15 ft; its overall width, about 6 ft 3 in., and wheelbase is about 8 ft 8 in.

Hudson Profit Last Year \$2 Million Over 1949

The Hudson Motor Car Co. has reported a net income of slightly more than \$12 million for last year. This compares with earnings of \$10.1 million in 1949. Last year Hudson shipped 143,586 cars.

Cadillac Builds First Tank at Cleveland Plant

GM's Cadillac Motor Car Div. has turned out the first light tank at its Cleveland plant three months ahead of the original starting date. Output is

ployes, and 6000 sub-subcontractors furnish components for the tank which is called the Walker Bulldog and is a modification of the T-41.

Cadillac will later undertake production of a different type combat vehicle, a tank equipped with twin Bofors 40-mm anti-aircraft guns. The Cleveland operation will serve as a central engineering agency for certain components which are common to five other combat vehicles being built for Ordnance by other manufacturers.

Ford to Build Tank Plant Near Detroit

Ford will build a large plant for production of medium tanks in Livonia,

in the first three months of this year is an accepted fact, but just how much lower it will be is entirely a matter of individual opinion. Materials restrictions which went into effect April 1 are certain to affect car output, but to what degree is highly uncertain. Consensus is that it will vary anywhere from 5 to 15 per cent below the first three months of the year. Trucks on the other hand are scheduled to increase, but because the production figures reported include both civilian and military units, it is difficult to say accurately how strictly civilian production is doing in relation to the corresponding months of a year ago. In March truck output set a new monthly record of about 138,000 units. However,

News of the AUTOMOTIVE

when military vehicles are subtracted, the number of trucks for civilians would not be a new record.

The government order banning spare tires on new cars will not in itself affect production such as would have happened to some extent, possibly, had the original plan of reducing the supply of tires for passenger cars 25 per cent below the number delivered for that purpose during the first quarter been adopted. However, the principal factor governing production now is steel, especially the alloys. There is considerable opinion in the industry that by May or possibly June car manufacturers will not get enough steel to build up to the allowable 80 per cent of their base period quota. Some companies have already started to reduce output by laying off employees. GM has started laying off at Kansas City, Baltimore, and South Gate, Calif., assembly plants. Hudson has started layoffs that eventually will extend to 3500 of its 24,000 employees. Studebaker has laid off about 4000 workers. The situation at Chrysler is uncertain because of its unusual base period brought about by the strike last year. The company reports that its base period has not yet been officially determined, and when that happens adjust-

ments may be necessary. Another shortage facing the industry is in upholstery materials. Wool is in very short supply and is getting worse, with one company saying that there will not be any available for automobile upholstery by next fall or winter. The company is also experiencing difficulty getting enough nylon for even its most expensive models.

Lockheed Net in 1950 Was \$7.2 Million

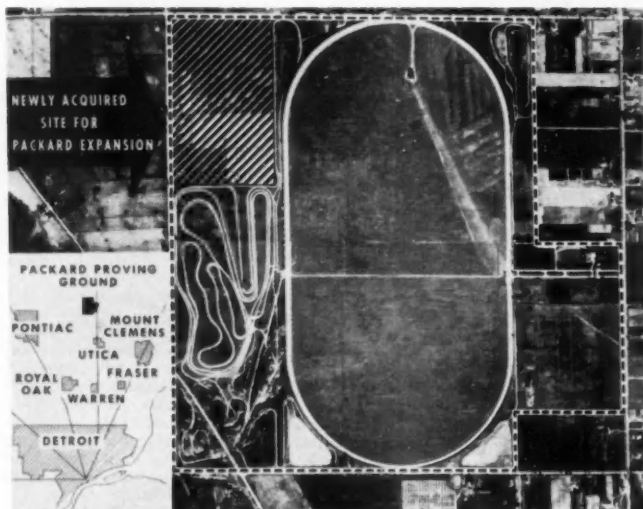
Sales of the Lockheed Aircraft Corp. increased during 1950 to \$173,331,000 for a 47.3 per cent improvement over 1949, President Robert E. Gross announced. Earnings after taxes amounted to \$7,210,000, highest for any year since World War II and up 31 per cent from 1949's \$5,491,000. Earnings were equivalent to \$6.45 per share on 1,118,514 shares outstanding, compared to \$5.10 per share in 1949. Lockheed's backlog rose from \$229,746,000 at the end of 1949 to a current total estimated in excess of \$625 million.

Lockheed plans to construct a \$2 million office building to accommodate 1500 administrative and engineering personnel at the company's Burbank, Calif.,

headquarters. Construction on the five-floor, 165,000 sq ft building began about April 1.

GSA Issues First of Tool Pool Orders

First of the machine tool pool orders authorized under NPA's M-40 order has been issued by the General Services Administration in the amount of more than \$63 million. Under the NPA authorization, these are firm orders and may be drawn upon by manufacturers with defense orders and any tools not disposed of in this manner will be bought and stored by GSA until needed. The price of GSA for any tools taken over will be the sales price less 17½ per cent, the estimated profit and sales expense. The first batch of orders consisted of the following contracts (in rounded figures): Warner & Swasey Co., \$12,333,000; Gisholt Machine Co., \$12,200,000; Jones & Lamson Machine Co., \$9,029,000; Norton Co., \$8,266,000; National Broach & Machine Co., \$4,452,000; Gear Grinding Machine Co., \$3,532,000; Gleason Works, \$3,314,000; Gouls & Eberhardt, Inc., \$2,127,000; Cleveland Hobbing Machine Co., \$1,059,000; Illinois Tool Works, \$980,000; and, Bardons & Oliver, Inc., \$524,000.



PROVING GETS MORE

As shown in the photograph and map above, Packard Motor Car Co. has added to its proving ground near Utica, Mich., 55½ more acres which are now available for the construction of manufacturing and test facilities to handle new defense contracts. The Proving Ground totals 560 acres with the newly-acquired land.

Nash Gets Big Aircraft Engine Contract

Nash-Kelvinator Corp. has been awarded its first contract under the current defense program. The company has an Air Force letter contract to build a large number of Pratt & Whitney R-2800 double Wasp aircraft engines. The dollar value of the contract was not revealed. The R-2800 is an 18-cyl radial aircooled reciprocating engine of about 2100-hp, and is an advanced version of the type produced in large quantities by Nash during World War II. The horsepower rating can be increased substantially by the use of water injection. The engine will be used in Air Force trainer and cargo planes and Navy fighters, trainers and cargo planes. Assembly and testing will be done at Kenosha in facilities used for aircraft engine production in World War II. Some of the components will be produced by Nash in existing buildings in Milwaukee and Kenosha. In addition a large building program will supplement existing Nash factory facilities. The engine program will not interfere with production of cars and home appliances, according to G. W. Mason, Nash president and chairman.

INDUSTRIES

Pontiac Awarded Two Defense Contracts

GM's Pontiac Motor Div. has been awarded its first two major contracts under the present defense program. It will build a completely new amphibious cargo carrier, a tracked vehicle with a stern propeller for water operations. Initial value of the contract is \$45 million. Pontiac also has an Army Ordnance contract for a large number of rockets. Value of the initial order is \$12.5 million.

Report Says Studebaker Will Build Jet Engines

It is reported that Studebaker has an order for production of J-47 jet en-

and a compressor driving turbine. The compressor has a rated speed of 36,000 rpm; the turbine has a rated speed of 24,000 rpm, drives through reduction gears which give a propeller speed of 2500 rpm.

Saginaw Steering Awarded Second Defense Order

Saginaw Steering Gear Div. of GM has been given another defense contract. It calls for production of hydraulic control mechanisms for the Republic F-84-F jet fighter planes which will be built by GM at Kansas City, Kans. Earlier the division had been awarded a contract to build parts for small arms.

Force. The craft is undergoing experiments with its ground rig, according to an armed forces spokesman, before it is put into flying condition by the addition of a flight control system, tail boom, tail rotor and horizontal stabilizer. The "world's largest helicopter" is designed for short range moving of such military equipment as trucks, tanks, and bridge sections, straddling its cargo in the manner of the lumber lift trucks. Two modified GE turbos-jets power the helicopter.

Ford to Import Small British-Built Car

The Ford Motor Co. is going to import a new British-built small car,

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	Per Cent Change				
		January 1951	December 1950	January 1950	Jan. Over Dec.	Jan. Over Jan. 1950
1	New England	38,668	34,081	21,176	+10.60	+28.92
2	Middle Atlantic	81,241	100,389	72,968	-18.06	+11.31
3	South Atlantic	63,777	54,496	48,448	+17.03	+31.02
4	East North Central	115,809	171,393	93,905	-32.61	+23.83
5	East South Central	24,483	23,080	21,708	-2.36	+12.76
6	West North Central	48,443	56,957	35,185	-16.85	+28.18
7	West South Central	51,997	43,066	37,026	+20.77	+40.43
8	Mountain	16,811	17,349	11,854	-4.25	+40.13
9	Pacific	47,039	60,367	39,671	-22.06	+16.67
Total—United States		472,706	652,289	381,562	-14.40	+23.90

States comprising the various regions are:—Zone 1: Conn., Me., Mass., N. H., R. I., Vt.;—Zone 2: N. J., N. Y., Pa.;—Zone 3: Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va.;—Zone 4: Ill., Ind., Mich., Ohio, Wis.;—Zone 5: Ala., Ky., Miss., Tenn.;—Zone 6: Iowa, Kan., Minn., Mo., N. D., S. D.;—Zone 7: Ark., La., Okla., Tex.;—Zone 8: Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.;—Zone 9: Cal., Ore., Wash.

gines for the Air Force. The company recently took possession of a plant in Chicago which it used during the last war for building aircraft engine parts and will use it for turning out parts for the jet engines.

Chevrolet to Produce Shells At St. Louis

Chevrolet has been awarded a contract to build artillery ammunition in three buildings of the St. Louis Ordnance plant it operated during 1944-45. Value of the contract is more than \$25 million. Production is expected to start within a few months.

Navy Testing Gas Turbine Powered Boat

The Navy is now testing a gas turbine powered boat at the Naval Engineering Experiment Station, Annapolis, at speeds up to 21 knots from the 175-hp, 200 lb Boeing-designed engine which burns gasoline, kerosene, light or heavy fuel oil. The engine consists of a single stage centrifugal compressor with two outlets, two constant pressure burners,

Buick to Build Plant for Jet Engine Job

Buick will start construction soon of a large new one-story plant for part of the manufacturing operations for the jet engine it will build for the Air Force. The new plant will be located on a 16-acre site adjacent to Buick's main manufacturing plant in Flint, and will contain about 580,000 sq ft of floor space.

K-F to Double Area of Aircraft Plant

Kaiser-Frazer is doubling the manufacturing space at its Oakland, Calif., aircraft division. A new one-story plant will be built to add an additional 50,000 sq ft of manufacturing space for production of parts for Lockheed patrol bombers.

Hughes Ground Testing Jet Helicopter

Hughes Aircraft Co. has resumed ground tests of the jet-propelled XH-17 helicopter, built for the U. S. Air

Force, for sale by Ford and Lincoln-Mercury dealers in this country. The car, built by Ford Motor Co. of England Ltd., is in the small car category with a wheelbase of 100 in. and overall length of 162 in., is 64 in. wide and has overall height of 61 in. The car is priced at retail in the \$1700-\$1800 range at port of entry, which is above the retail delivered price of several U. S. made Ford models which are larger and far superior in performance. Apparently, importing of the Consul is an attempt by Ford to aid the British in the matter of dollar exchange.

It will be manufactured in one model only—a five-passenger, four-door sedan—and will be sold initially through 100 Ford and Lincoln-Mercury dealers. It has a four-cyl overhead valve, 92-cu in. engine rated at 47 hp at 4400 rpm. Bore is 3 1/2 in. and stroke 3 in. Other features include three-speed synchromesh transmission, Hotchkiss drive, and a hydraulically assisted clutch mechanism. It is said to be comparable in economy to other British built Fords which give up to 37 mpg, and has a top speed of 70 mph.

News of the AUTOMOTIVE

British Car Industry Paid Over \$560 Million in Taxes in '50

High automobile taxation is pushing up the cost of living and is threatening disaster for the British automobile industry by making it impossible to produce at competitive prices, according to a statement made by the British Society of Motor Manufacturers. More than \$560 million are now being paid over to the State in license fees, fuel taxes and purchase taxes. At the same time the automobile industry last year earned \$745 million worth of hard currency and was Britain's biggest exporter. The Society calls for a halt in taxation striking specially at the automobile industry. Most pernicious is the purchase tax which, being based on the selling price of automobiles, increases with the cost of the vehicle. It is claimed that the annual British taxes on a small car amount to \$134, compared with about \$90 in the United States including an allowance for sales tax.

Dividends Up a Fifth in 1950

Paced by the automotive industries, publicly reported dividends (about two thirds of the total) increased by a fifth during 1950 to a total of \$7.9 billion. Total reported for 1949 amounted to slightly over \$6.4 billion. Iron and steel dividends last year were reported at \$490 million as compared with \$362 million for 1949. Increased rates of

return from steel manufacture were exceeded by automobile manufacture where cash dividend payments were increased from \$519 million to \$768 million. Revision of freight rates and increased haulage enabled the railroads to pay out \$289 million as against \$258 million in 1949. Mining stocks paid \$392 million as against \$322 million.

Trico to Build New \$1 Million Plant

A \$1 million building permit has been issued to the Trico Products Corp. for a new manufacturing plant to be erected in Buffalo, N. Y. The building will be of brick and concrete construction, and will adjoin Trico Plant 3. It will be four stories high and will cover an area of 220 by 314 ft.

GM Locomotive Drives Going to Australia

GM has announced that it will soon start supplying major components for Diesel locomotives to be built in Australia. The Diesel-electrics will be built by Clyde Industries of Sydney, New South Wales, through arrangement with GM. Engine and transmission equipment will be built by GM's Electromotive Div. at LaGrange, Ill., and shipped to Australia for use in locomotives built there.

To Build Fiat Trucks in Mexico

The Fiat company of Turin, Italy, has successfully concluded arrange-

ments for the establishment of a factory in Mexico to manufacture trucks. It is planned to produce at least 1000 Fiat trucks a year, and future production also calls for production of farm tractors—both to be equipped with Diesel engines. National Financiera, official government finance company, has released details of the new contract. The new plant is financed at 75 million pesos (about \$8.5 million), with the government's financial agency putting up 35 million pesos. The balance of 45 million pesos is to be supplied by the Fiat company, Luis Montes de Oca, president of Banco Nacional in Mexico acting on his own individual initiative, and Bruno Pagliai. It is claimed that the local market will be easily able to absorb the entire original output of the new factory, and will probably also handle all future increased production without difficulty.

Govt. Board to Coordinate Electronic Output

The establishment of an Electronics Production Board which will be responsible for overall coordination of electronic production under the mobilization program has been announced by Defense Production Administrator William H. Harrison. Administrator Harrison pointed out that the use of electronic devices has grown to such widespread proportions in the equipment for defense, the machines of industry, and the nation's communication facilities that any failure to develop and produce electronics on schedule could affect the entire mobilization program. The same basic components that go into radio, television, radar, fire control and communication equipment now find application in electric motors, automobiles, fluorescent lighting, business machines, industrial control devices, test and measuring equipment and many others.

Ford Repeats Industrial Arts Competition

The Ford Motor Co. has announced that its industrial arts awards competition will be offered again this year with prizes totaling \$35,000 in cash and nine all-expense paid trips to Detroit and Dearborn. The contest is open to junior and senior high school students attending industrial arts and vocational classes. Entries must be regular class projects made under supervision of instructors. This year's program is on a regional basis with sectional eliminations in Kansas City, Philadelphia, and Los Angeles. National finals will be held in Chicago.

1951 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the January, 1951, Totals

MAKE	January		Per Cent of Total	
	1951	1950	1951	1950
Chevrolet	29,314	27,720	22.763	33.30
Ford	20,099	24,140	17.796	23.74
Dodge	10,730	10,969	8.305	12.19
G. M. C.	8,967	9,069	5.067	10.19
International	8,121	5,084	5.083	9.22
Studebaker	3,195	3,205	3.497	3.63
Willys-Overland	1,672	1,689	843	1.90
White	1,277	1,407	633	1.45
Mack	1,005	1,961	821	1.14
Willys-Jeep	884	809	592	.79
Divco	408	436	269	.46
Diamond T	407	489	411	.60
Reo	397	518	256	.45
Brockway	267	250	154	.30
Autocar	189	187	113	.21
Federal	112	131	101	.13
Pontiac	88	56	147	.10
Kenworth	74	95	32	.06
Starling	45	33	23	.05
F. W. D.	38	34	40	.04
Peterbilt	22	31	22	.02
Crosley	127	121	177	.14
Misc. Domestic	21	15	40	.02
Misc. Foreign	21	15	40	.02
TOTAL - All Makes	88,068	98,273	87,925	100.00

* Based on data from R. L. Polk & Co.

INDUSTRIES



FIRE FIGHTER

Demonstrated recently by Walter Kidde & Co., Inc., this self-contained, fire-fighting crash truck is equipped to attack any type of fire with water, foam, fog, or carbon dioxide. It was designed to meet airport fire emergencies, requirements of municipal fire departments, and serve as a civil defense fire fighter. Powered by a 162-hp engine, it has an overall length of 25 ft 6 in., is 8 ft wide, and 10½ ft high.

Black & Decker Building New Plant

The Black & Decker Mfg. Co., Towson, Md., broke ground recently for a new 100,000 sq ft branch plant at Hampstead, Md. It is planned that the new plant will be in operation by the early spring of 1952.

Borg Warner 1950 Earnings Set All-Time Record

Borg-Warner has reported an all-time high in sales and earnings for last year. Net profit after all charges was slightly more than \$29 million compared with \$22 million the previous year. Net sales last year were \$330.9 million, compared with \$252.3 million in 1949. An interesting note in the report is that taxes last year totaled more than \$35.2 million, more than double the \$16.1 million paid in taxes in 1949.

Air Force Sets Up Pool for Aircraft Extrusion Dies

What amounts to a national aircraft extrusion die pool has been set up by the Supply Div., Air Materiel Command, Wright-Patterson Air Force Base, Dayton, O. This interchangeability program provides a step toward standardization of extrusion dies and specifications and should eliminate bottlenecks in the aircraft and aluminum and magnesium extrusion industries. It is sponsored jointly by the Air Force, Navy Bureau of Aeronautics, and the aluminum, magnesium and aircraft associations. All aircraft manufacturers

and extrusion producers, whose shapes of aluminum and magnesium alloys are used by the Government, are participating. Under the program, each participating manufacturer relinquishes proprietary rights to his own extrusion dies, which become available to any other participating manufacturer or government agency. The Air Force Catalog and Coordinating Section of the Air Materiel Command Supply Div. will screen and catalog all active aircraft extrusion shapes, making one ready information file for use by industry.

Car Dealers Split 50-50 on Territory Protection

Results of a survey conducted by NADA among its dealer members shows that general assumptions are not always warranted. It had been assumed that most dealers which would favor territory security clauses in their franchises, but the survey revealed that exactly one-half of dealers answering the questionnaire stated they did not want territory security or other infringement clauses in their selling agreement.

Allis-Chalmers To Build Foundry At Norwood, O.

Allis-Chalmers will soon start construction of a new \$400,000 non-ferrous foundry at its Norwood, O., works. It will include a one-story metal building 80 by 210 ft, and a new 20 by 50 ft oil house. Equipment will include melting pots, molding machines and sand-conditioning equipment.

French to Make New British Hercules Engine

A license to manufacture the Bristol Hercules aviation engine has been taken up by the French national engine factory, the S.N.E.C.M.A., which was the Gnome & Rhone before the French industry was nationalized. Under the agreement, a substantial number of Hercules engines will be supplied from England while the French production line is getting under way.

1951 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the January, 1951, Totals

MAKE	January 1951	December 1950	January 1950	Per Cent of Total	
				1951	1950
Chevrolet	114,823	108,013	84,867	24.23	22.24
Ford	70,562	62,951	70,654	16.03	16.52
Plymouth	39,312	62,368	43,407	8.32	11.36
Buick	37,396	54,296	26,038	7.91	7.35
Pontiac	37,262	38,274	27,227	7.90	7.14
Dodge	23,471	32,262	23,694	4.96	6.20
Mercury	22,960	26,986	17,551	4.88	4.60
Oldsmobile	22,469	36,829	16,592	4.78	5.13
Studebaker	19,422	20,121	14,404	4.11	3.77
Chrysler	12,573	10,130	12,000	2.68	3.17
Nash	11,228	13,004	7,564	2.27	1.99
De Soto	9,091	14,627	8,429	2.06	2.21
Cadillac	9,441	7,436	2,737	2.00	0.72
Hudson	9,334	9,973	9,190	1.97	2.39
Packard	7,000	7,579	4,148	1.48	1.08
Kaiser	5,533	5,757	2,056	1.17	.67
Henry J.	4,550	4,518		.96	
Lincoln	2,810	3,348	1,968	.59	.40
Willlys	2,421	2,282	1,820	.51	.46
Crosley	942	501	519	.11	.14
Fraser		282	412	.11	.11
British Austin	424	317	444	.09	.12
British Ford	291	192	73	.06	.02
Misc. Foreign	1,654	932	275	.23	.07
Misc. Domestic	197	279	15	.04	
TOTAL—All Makes	472,706	532,259	381,962	100.00	100.00

* Based on data from R. L. Polk & Co.

U. S. Post Office Wants to Spend \$4.5 Million for Trucks in '52

At hearings before a subcommittee of the Committee on Appropriations, House of Representatives, 82nd Congress, first session, C. N. Bruce, director, Division of Budget and Planning, Bureau of Post Office Operations, said, "the principal element of this increase is that of \$4,566,000 for the purchase of new trucks in 1952. This will provide for the purchase of 6357 new trucks, which will increase our fleet not to exceed 17,500, and will permit the retirement of all overage trucks; that is, those that have reached generally 60,000 miles or six years depending on the size of the truck. At the present time, or as of June 30, 1950, 14,624 vehicles of all types were on hand. For 1951 we are purchasing 5225 new trucks, and in 1952, 6357 new trucks will be purchased.

French Talbot Company Stops Operations

The French Talbot Company has ceased operating because of financial difficulties. The French courts, however, have agreed to a reorganization of Talbot, and it is expected to resume operations at an early date. It is probable that under the new scheme armament productions will be undertaken. Founded by Alexandre Darracq, about 1895, as the A. Darracq Company, Talbot is one of the oldest of the French automobile organizations. In the early

1900's it was very prominent on the American market, running the first gasoline taxicab service in New York City, breaking records on Daytona Beach with a V-eight, and winning the Vanderbilt Cup race on Long Island in 1906. Linking up with Sunbeam and Talbot in England, for a brief period, the name was changed to Talbot-Darracq, and then to Talbot. The firm specialized in a high-grade sports type of car, with which it won first and second places in the Le Mans 24-hour road race last year, breaking all records.

New Ford Engine Plant at Rouge Delayed

Ford's plans for using the former aircraft engine plant at the Rouge for a new engine plant have apparently been sidetracked. The entire space is to be used for manufacture of tank engines and other military work, presumably parts for the large aircraft engine Ford will build in Chicago. Originally the plant was to have been tooled for a new engine, with the job to be completed by next October.

Diamond T Earnings Show Gain Over '49

Net earnings of Diamond T Motor Car Co. for last year were \$328,981, compared with \$148,581 the previous year. The company told stockholders

that material procuring problems and labor troubles in supplier plants were major difficulties last year. Diamond T has a government order for more than \$50 million worth of large trucks on which production is scheduled to start in June.

Vehicle Export Sales Show Sharp Rise

Export of passenger cars from the U. S. have taken a sharp turn upward with February sales abroad the highest for any month since the end of World War II. Exports in February totaled 24,626 units to exceed the previous record of 23,117 units established in May, 1947. Trucks exported also show a sharp rise with a total of 35,403 for the first two months of this year, being nearly double the 17,977 exported in the same period of 1950. Total motor vehicles, including buses, exported during January and February was 79,119—more than double the 38,512 units sold abroad during the same period of a year ago. Most of the exports this year are to countries in the Western Hemisphere, with the largest quantities going to Mexico, Cuba, Brazil and Canada.

Scrapage Of Old Cars Half Of Prewar Rate

R. L. Polk & Co., Detroit automotive statisticians, has analyzed scrapage reports and find that old cars are not being scrapped at anything like prewar rates. Between 1940 and 1941, 9.6 per cent of the cars 5 to 11 years old were junked and 34 per cent of those older than 12 years went off the road. Between 1949 and 1950, however, scrapage of cars 5 to 11 years old was only 2 per cent of the total in that age group and for cars 12 years old and older only .17 per cent were scrapped. In 1941, 6.9 million middle-aged cars between 5 and 8 years old were on the road whereas there were none in 1950. On the other hand where there had been 3.1 million cars in the elderly group, 8 to 10 years old, before the war, at the end of last year 8 million cars were in that age bracket.

Canada Shipped 39,000 Vehicles in January

Canadian factories shipped a total of 39,204 new motor vehicles in January—a new high for the month—compared with 30,738 in December and 28,527 in January, 1943, the Canadian Bureau of Statistics reported. January shipments were close to the monthly peak totals of 41,383 units in June and 41,131 in July last year.



MUCH MORE

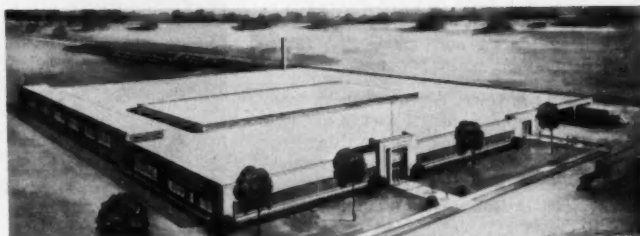
Shown here side by side (left to right) are the new GM Allison Div.'s J35-A-23 super jet engine and its predecessor J35-A-17 turbo-jet. The new engine is said to be much more powerful than any jet produced, yet fuel consumption has been considerably reduced. Looking over the engine are Henry Davaney, project assembly engineer, and Frank Herdrich, experimental engine assembly foreman.

Continental Expands Working Capital

Continental Motors is the first major company to arrange for a V-loan to finance defense production. The company has arranged for a \$30 million credit with a group of banks to finance its increasing military production. Continental started producing military engines in 1949, and is now far enough into its program to require a large working capital to finance tooling and inventories. A 810-hp tank engine is currently in production for heavy tanks, the largest engine in the family of six air-cooled engines developed in collaboration with Army Ordnance. Another model has been ordered to power a tank of unannounced size.

To Build Gasoline-from-Coal Plant in South Africa

The M. W. Kellogg Co., has announced that the construction of what is described as the world's first modern, commercial, gasoline-from-coal synthe-



TOUREK'S NEW PLANT

J. J. Tourek Mfg. Co., Chicago, manufacturers of precision screw machine products, ball joints, and pipe plugs has started construction on this new plant. The new one-story structure will have an area of 60,000 sq ft, twice the space of the company's present quarters.

duction: sheet, plate, circles and blanks, 55 per cent; extrusions and tubing, 60 per cent; rolled shapes, 45 per cent; rod, bar, wire and cable, 50 per cent; forgings and pressings, 75 per cent; castings, 55 per cent; secondary ingots, 60 per cent; and, all other mill products, 55 per cent. No change is made in the lead time. Orders in excess of

Chrome Trim Blackout to be Averted

Dire predictions the first of this year that bright work would disappear from passenger cars within two or three months have not materialized, and it now seems likely that the flash and glitter will remain indefinitely in one form or another. So far the industry has fared much better than was expected and various rules and regulations have had little effect on bright work. Orders on nickel and copper have been modified to some extent and it now looks as though when present nickel inventories are exhausted manufacturers will go to chrome plating directly on copper, possibly with an overlay of clear lacquer or plastic.

Goodrich Earnings Show Big Gain

The B. F. Goodrich Co. has reported a net profit of \$34.7 million for 1950, an increase of 55 per cent from the previous year when earnings totaled \$20.9 million. Sales last year were 40.1 per cent ahead of the previous year, totaling more than \$543 million, the highest in history. The report pointed out that crude rubber prices advanced from 18½ cents a pound at the beginning of the year to a high of 90 cents during the year, and that at year end was 79 cents a pound. It also stated that 476,000 tons of synthetic rubber was produced in this country last year, and that production by the end of April is scheduled to reach the rate of approximately 900,000 tons a year.

Caterpillar Official Aids Munitions Board

W. J. McBrien, vice president of Caterpillar Tractor Co., has accepted the post of vice chairman of the Munitions Board. His services will be loaned to the government by Caterpillar for several months.

1951 MOTOR VEHICLE FACTORY SALES FROM U. S. PLANTS*

	Passenger Cars	Trucks	Buses	Total Vehicles	
				1951	1950
January	478,589	127,583	861	606,933	640,925
February	505,865	111,936	821	618,321	475,465
Total—Two Months	984,454	239,519	1,682	1,225,154	1,086,827

1951 TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb and Less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	56,290	23,882	7,884	23,289	6,717	6,361	3,376	127,583
February	48,978	19,496	7,638	20,054	6,321	5,972	3,476	111,936
Total—2 Mos. 1951	105,268	43,378	15,522	43,343	13,038	12,333	6,852	239,519
Total—2 Mos. 1950	94,955	39,564	14,726	30,116	6,201	4,816	3,210	183,290

* Automobile Manufacturers Association.

sis plant will start in South Africa in the near future. The plant is being engineered and built for SASOL-South African Coal, Oil and Gas Corp., Ltd. It will be located adjacent to the Vaal River, near the town of Coalbrook in the Orange Free State, about 40 miles south of Johannesburg.

Government Amends Aluminum Order

An amendment to M-5 last week ordered an additional 15 per cent set aside by aluminum producers and fabricators and an extra 20 per cent by distributors and jobbers of aluminum products for filling rated orders. It now requires that producers or fabricators accept rated orders up to the following percentages of average base period pro-

these percentages do not have to be accepted unless specifically directed by NPA.

Fruehauf Sales and Net Last Year Broke Record

Fruehauf Trailer last year broke all records for earnings and sales. Net profit was \$8.62 million or more than three times the \$2.8 million earned in 1949. Sales last year hit a record \$132 million, 64 per cent above the \$80.5 million in 1949, and \$44.1 million higher than the previous peak sales record established in 1948. The company reports that materials shortages have affected production and that its current backlog of civilian orders for trailers approximates 10,000 units.

How to make a car a "blue blood" in the Red Book

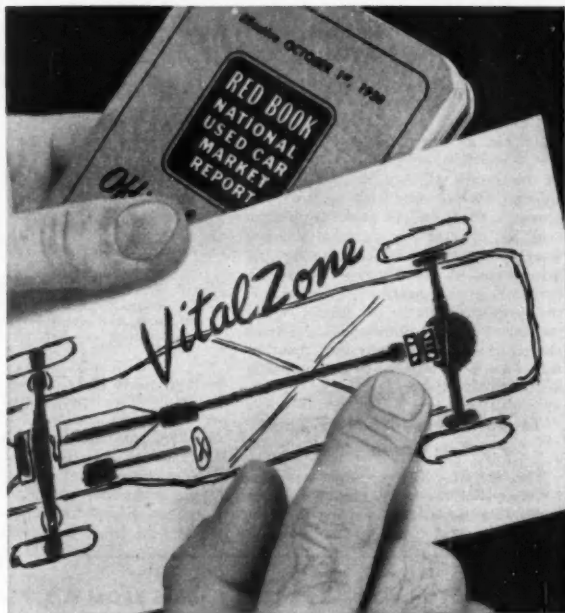
ANY new car is hard to resist in the showroom. But what is it that keeps that appeal from fading and makes the car a standout in a used car lot?

The answer is value. Although style, comfort and other appeals play a part in selling a prospect in the first place, the big thing that keeps him sold is value. Motorists are becoming more and more conscious of value. Especially where it counts most—in moving parts, the "vital zone".

When buying "vital zone" parts for your car—pinion bearings for instance—you may find it helpful to keep in mind this simple guide to value:

$$\text{Value} = \frac{\text{quality} + \text{service} + \text{public acceptance}}{\text{price}}$$

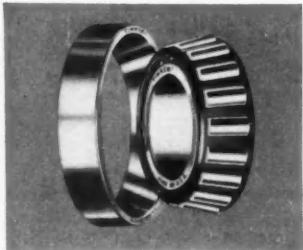
Obviously, a big advantage above the line gives you more value than a small one below it. No other bearing can match the uniform high quality, extensive and varied service support and overwhelming public acceptance you get with Timken® bearings. And in terms of value features, Timken bearing prices are lowest today. The Timken Roller Bearing Company, Canton 6, O. Cable address: "TIMROSCO".



How TIMKEN® bearings give you value where it counts most ... in the "vital zone":



THE TIMKEN COMPANY'S ENGINEERING STAFF is always available to assist automobile manufacturers in solving bearing mounting problems and to devise ways and means of simplifying assembly. This service is just one more way the Timken Company assures you of top value.



THE TOUGHEST BEARING APPLICATION on a car—the pinion—is one of the many places where Timken bearing value shows up in service. And all but two makes of cars use Timken bearings on the pinion. In wheels, steering gears, and throughout the "vital zone", Timken bearings give friction-free, trouble-free performance.

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TAPERED ROLLER BEARINGS

ONLY TIMKEN BEARINGS GIVE YOU ALL THESE VALUE FEATURES

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1. Design leadership
2. Steel made in our own mill
3. Precision manufacture
4. Rigid quality control
5. 50 years experience

SERVICE

6. Unequalled engineering service
7. Unequalled research and development facilities for your use
8. Installation service in the field
9. Widest range of sizes
10. Most dependable source of supply

PUBLIC ACCEPTANCE

11. First choice throughout industry
12. Best-known name in bearings
13. Widespread advertising

NOT JUST A BALL ● NOT JUST A ROLLER □ THE TIMKEN TAPERED ROLLER □ BEARING TAKES RADIAL ● AND THRUST → LOADS OR ANY COMBINATION ●

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers

Kaiser-Frazer Corp.—The appointment of **John H. Tacke** as operations manager was announced. **John Banks** was named works manager in charge of automobile production, and **Harvey Smith** as works manager in charge of aircraft manufacturing.

Ford Motor Co.—**Robert R. Nadel** has been appointed general sales assistant to **Walker A. Williams**, Ford vice president of sales and advertising.

General Motors Corp., Chevrolet Aviation Engine Div.—**C. W. Frederick** has been named chief production engineer.

General Motors Corp., Chevrolet Motor Div. Aviation Plant No. 1—Four new appointments have been announced: **Douglas M. Dunn**, assistant purchasing agent, Chevrolet-Flint Mfg., to be purchasing agent; **John J. Greenough**, to be master mechanic; **William B. Nichol** to be plant engineer; and **Ward S. Byrne**, personnel director.

General Motors Corp., Chevrolet Motor Div.—**C. A. Kleist** has been promoted to head the sales administrative department of Chevrolet Central Office.

Caterpillar Tractor Co.—**Robert E. Gilmore** has been appointed assistant factory manager of the company's Diesel engine factory.

M. W. Kellogg Co.—**Andrew Kalitinsky** has been named manager of the company's Special Projects Dept.

B. F. Goodrich Co.—**Gilbert F. Stenger** is now fleet sales manager of the truck tire sales department.

General Motors Corp., Fisher Body Div.—The appointment of **Carl W. Moyer** to the staff of the general manager of Fisher Body as defense plans coordinator was announced. **Ralph R. Nurdyke**, who has been Mr. Moyer's assistant, will succeed him as general industrial relations director.

Aro Equipment Corp.—The membership of the board of directors was increased from seven to nine members: **R. W. Morrison** and **J. P. Johnson** have been nominated to fill the newly-created directorships.

Standard-Thompson Corp.—**Walter E. Carlson** has been appointed works manager of the company's five manufacturing plants in Dayton, O.

Eaton Mfg. Co., Reliance Div.—**R. B. Little** has been appointed general sales manager.



Wagner Electric Corp.—**J. S. Smith** has been named director of purchases.

Hydraulic Press Mfg. Co.—**C. S. Immig** has been appointed director of purchases.



E. I. duPont de Nemours and Co., Inc.—Retirement of **Clarence W. Clark**, manager of the Chicago plant of the company's Finishes Div., was announced. Simultaneously, these other changes were announced: **H. Roy Ayres**, assistant plant manager at Philadelphia, becomes manager of the Chicago plant; **Louis S. Baker**, assistant plant manager at Parlin, N. J., becomes assistant plant manager at Philadelphia; **Norman I. Dress**, assistant plant manager at Chicago, becomes assistant plant manager at Parlin; and **Carrol A. Doran**, supervisor of the solvent area at Parlin, becomes assistant plant manager at Chicago.



Tabor will be superintendent of second shift. **Roland Satterlee** has been named superintendent of transmission production for the amphibious cargo carrier, and **Jesse C. Hunter** superintendent of assembly of the vehicle. Sheet metal plant superintendent, **Wm. L. Kelley**, will head all sheet metal operations, both automotive and defense.

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Pacific Airmotive Corp.—**George B. Sisley** has been appointed production manager, and **Boyd Dahle** chief design engineer.

Necrology

Robert S. Pearce, 50, vice president in charge of public relations and advertising policy of the General Electric Co., died in Schenectady, N. Y., on March 18.

Robert C. Byler, 61, advertising manager of SKF Industries, Inc., died on March 27 in Philadelphia, Pa.

Richard S. Foster, 58, chief accountant and assistant secretary of the Raybestos Div., Raybestos-Manhattan Co. in Stratford, Conn., died on March 26 in Bridgeport, Conn.

Fred W. Herman, 58, general manager of the Long Beach Div. of the Douglas Aircraft Co., died on March 26 in Long Beach, Calif.

Alexander Krapish, 61, one of the developers of the first Sikorsky helicopters, died on March 26 in Bridgeport, Conn.

Claude Sauzedde, 77, an automotive pioneer, died on March 26 in Detroit, Mich.

Nice Ball Bearing Co.—At a recent board meeting, **Theodore E. Spilker**, secretary, was made a vice president and secretary; **John E. Mullen**, formerly plant manager, was also made a vice president; and **Henry M. McAdoo**, assistant to Mr. Mullen, was advanced to the position of plant manager.

General Motors Corp., Buick Motor Div.—**Howard Bradow** has been appointed assistant superintendent of inspection in charge of manufacturing operations.

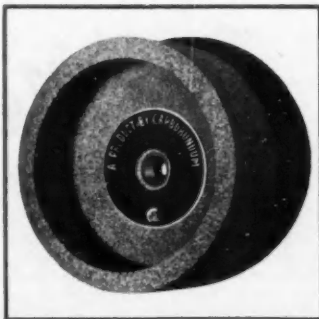
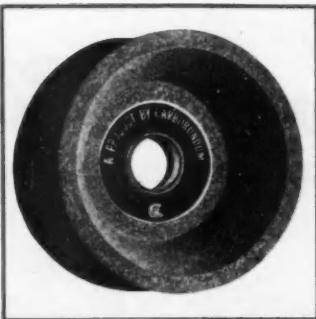
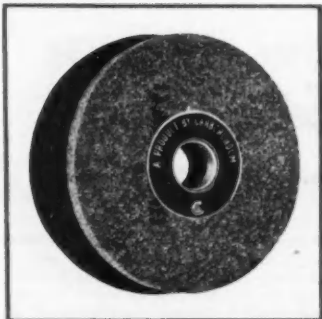
H. K. Porter, Inc.—**James G. Geddes** was elected president.

Chrysler Corp.—**Emlyn Lloyd** has been appointed general purchasing agent.

Packard Motor Car Co.—**N. C. Rogers**, Packard personnel executive, has been promoted to the new post of assistant industrial relations manager.

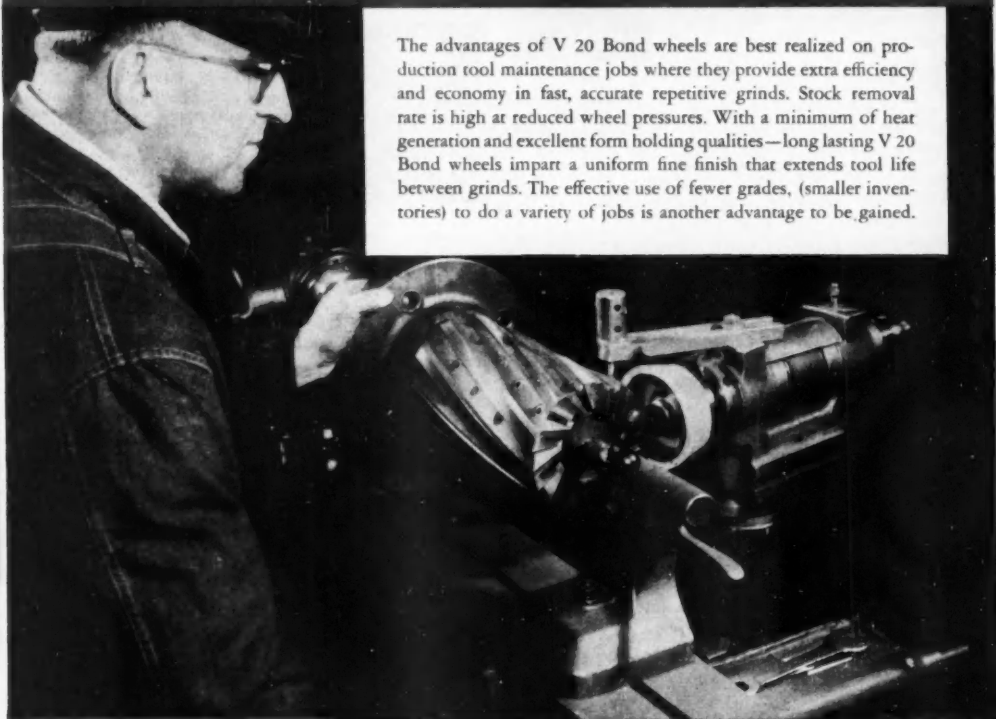
Fairchild Engine and Airplane Corp., Fairchild Aircraft Div.—**Armand J. Thieblot** has resigned his position as chief engineer.

General Motors Corp., Pontiac Motor Div.—Manufacturing manager, **Arlie F. Johnson**, has been placed in charge of all defense output, and **David J. Dunlop** will head automotive production, both remaining under general manufacturing manager, **Buel E. Starr**. **G. Robert Scharf** is named superintendent of the Army rocket project (days), and **Paul**



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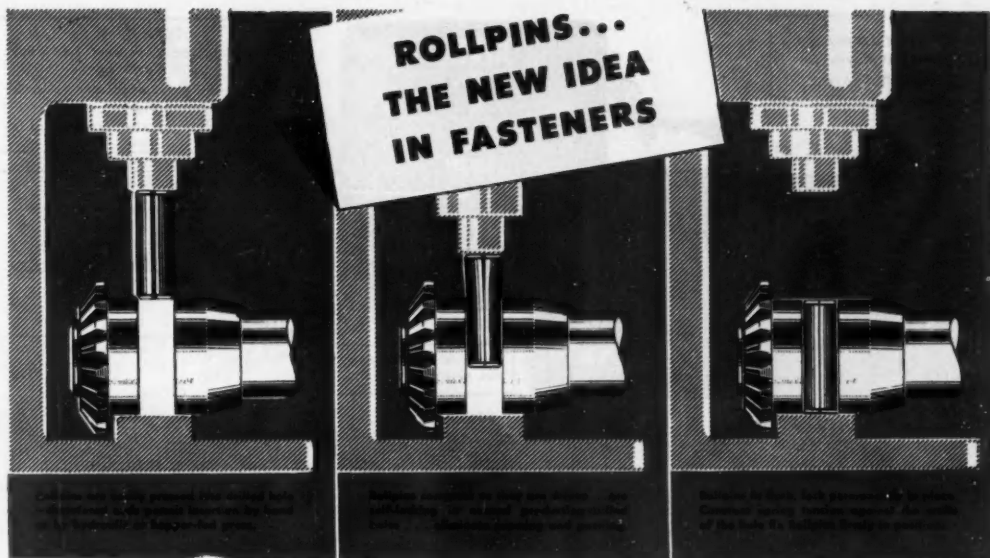
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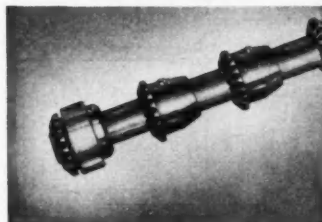
Slashing assembly time, inspiring new product designs, simplifying old fastening procedures, Rollpins are now

helping cut manufacturing costs as steel fastening pins holding pulleys and gears to shafts, as pivot or hinge pins, clevis pins, cotter pins, shafts, and locating dowels.

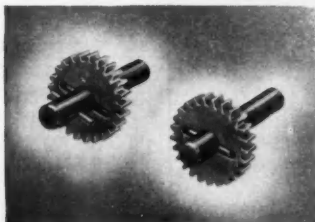
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More than 20 gears are quickly Rollpinned to gear train shaft used on farm equipment. Assembly time was cut... field service problems were solved because Rollpins drive out readily.

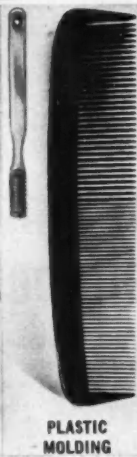
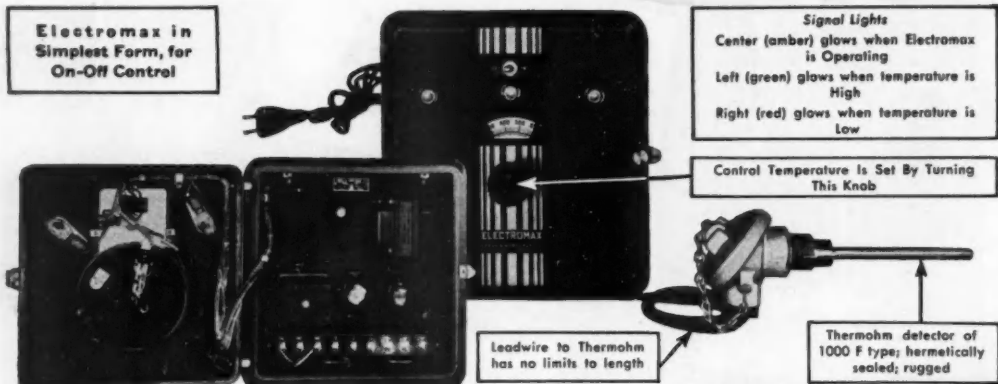


Rollpin is used as a self-retained pin in shaft... which is press-fitted into recess molded into sintered gear. Rollpin's unusual shear strength makes it ideal for this use.



Rollpins are supplied to specified lengths with chamfered ends. They are available from stock in a wide range of lengths in diameters from 5/64" to 1/2" in Carbon and Stainless Steels.

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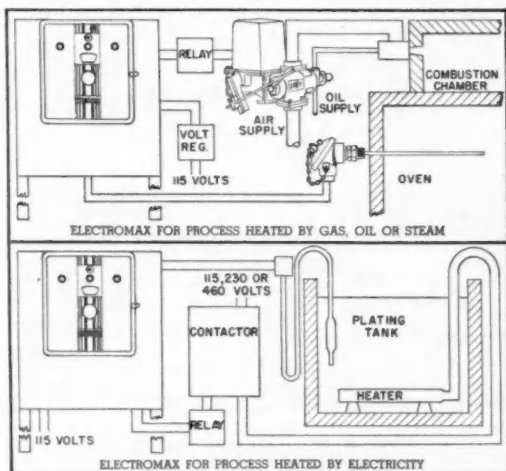
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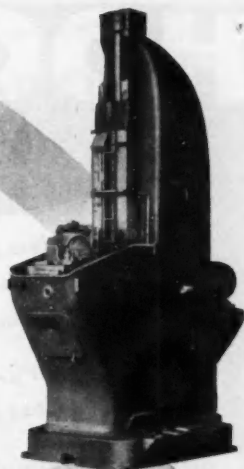
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surface broaching

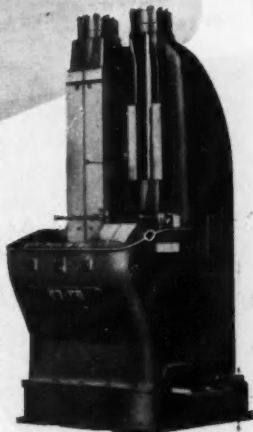
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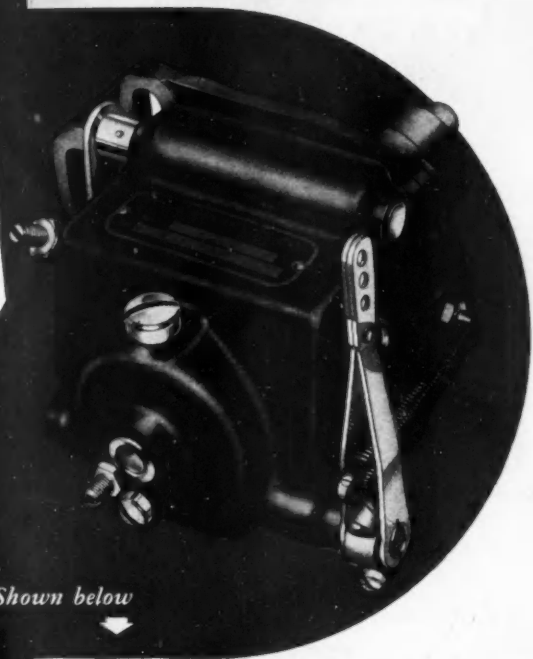
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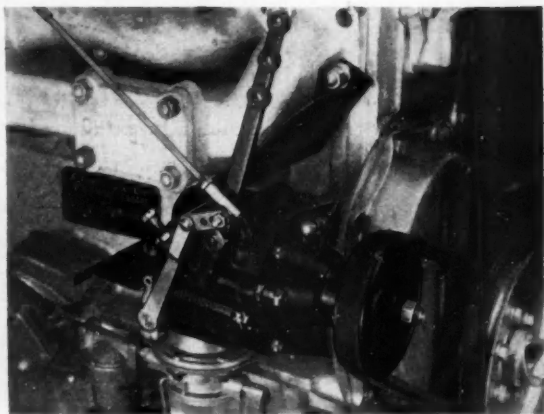
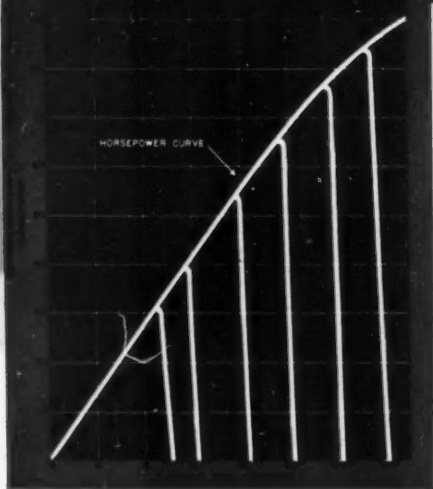
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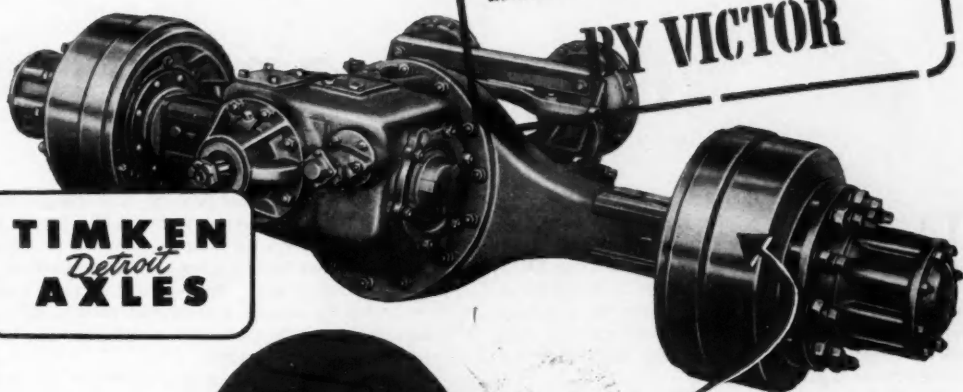
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Patented by Timken-Detroit, and made only by Victor, this inner axle seal fulfills every intent of its designer and user. Installed as a 2-piece assembly, the unit permits renewal of wearing parts and protects the seal from damage when servicing axle. Victoprene sealing element gives maximum efficiency to the flex joint.

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Whether you write the specifications or invite us to work them out with you, Victor places unmatched sealing experience at your disposal. 55 basic patents testify to Victor's grounding in modern oil seal design, including development of Victoprene—the now universally used Victor sealing element. Victor engineering service includes all laboratory facilities, also dynamometer testing.

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VICTOR

"ORIGINAL EQUIPMENT"

Gaskets and Oil Seals

SEALING PRODUCTS EXCLUSIVELY

Motor Vehicles of and Her

LEIPZIG, SOVIET ZONE, GERMANY

EASTERN Germany is now engaged in the manufacture of passenger automobiles of three main types: the IFA-DKW F8 and F9, and the BMW. Among those displayed at the Leipzig Fair last March was the IFA-DKW F9—a light, inexpensive car incorporating a number of unusual features. It is the most interesting, for it is at present being produced primarily for export to the West.

The F9 has a three-cylinder, two-stroke, 55 cu in. engine rated at 28 hp at 3600 rpm. The unique construction includes the engine, clutch, four-speed transmission, differential, free-wheeling unit and twin universal joints for front-wheel drive in one compact unit. Radiator and fan are behind the engine and thermosiphon water circulation is employed. A maximum speed of 70 mph is claimed.

A diamond-shaped chassis is used, with transverse leaf springs and hydraulic shock absorbers and brakes. Grease fittings are kept to a minimum through the use of central chassis lubrication. The F9 is manufactured in two two-door models — sedan and convertible — both with considerable overhang at the rear which provides for an adequate trunk. Wheelbase is 93 in., front and rear track width 47 in. and 50 in., length 165 in., height 57 in., and weight 1900 lb.

The price quoted for the IFA-DKW F9 sedan at the Leipzig Fair in March was \$850 fob Hamburg, and it was stated that this model is already being exported to Western Europe, particularly to Belgium, Holland, Norway and Finland.

The smaller IFA-DKW F8, also front-wheel drive, has a two-cylinder, two-stroke engine with a piston displacement of 42 cu in., rated at 20 hp. This also employs unit construction, but here the fan and radiator are in front and a combined six-volt generator-starter is used. In design and styling the F8 appears

to be of 1938 vintage and probably few changes have been made from the prewar light DKW. Except for the hood and fenders the body is of wood construction covered with synthetic leather. It is available as a sedan or convertible. The half-ton delivery wagon built on the F8 chassis is somewhat more modern in appearance than the passenger models, and this was priced at \$650 fob Hamburg.

These automobiles are manufactured at the now-nationalized DKW works in Chemnitz. This, together with the factories of Horch, Audi, Framo, Phänomen, Infesto and others, is controlled and operated by IFA, the state-owned motor-manufacturing enterprise. BMW, on the other hand, whose plant is located at Eisenach, is at present owned and operated by the Soviet authorities. The heavier BMW automobiles are being retained in Eastern Germany, shipped to Russia, or exported to Eastern Europe.

The two latest models exhibited at the Leipzig Fair were the 342 and 343 four-door sedans. The engine for these, as well as that in the BMW delivery wagon and ambulance displayed at the show, is a six-cylinder in-line unit of 120 cu in. piston displacement, rated at 55 hp at 3750 rpm. This has side valves, light

alloy pistons, two down-draft carburetors, and single plate dry-plate clutch. There is a four-speed forward transmission, with free-wheeling in first and second gear.

The front wheels of the sedans use cantilever suspension with torsion bars, while coil springs support the rear drive axle; there are telescopic shock absorbers and hydraulic brakes on all four wheels. On the delivery wagon, the front has a transverse leaf spring with torsion bars at the rear. The weight of the sedans is 2400 lb, wheelbase 113 in., track width 51 in. and 55 in., and length 190 in. The ambulance

(Turn to page 98, please)

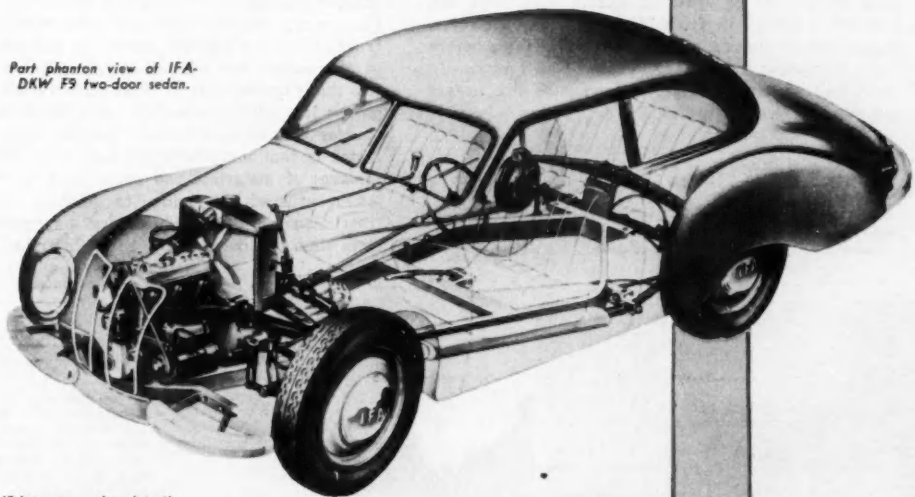
By
David
Scott

Russia Satellites

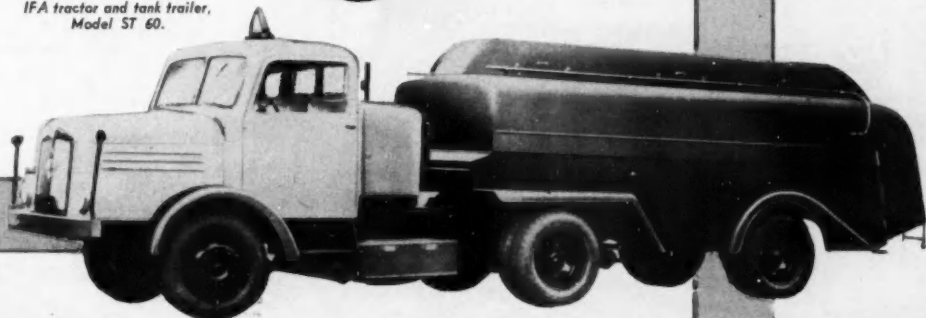
BMW 343 four door sedan.



Part phantom view of IFA-DKW F9 two-door sedan.



*IFA tractor and tank trailer,
Model ST 60.*





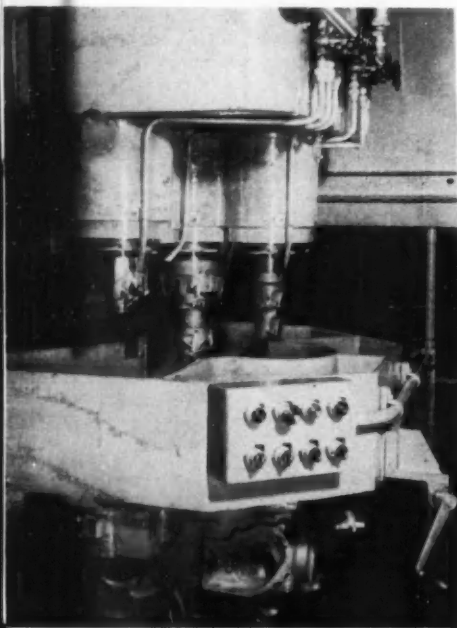
Defense Again the

TEN years ago the automotive industries were tooling up to provide an arsenal for the free nations of the world against aggressors. Today it is their No. 1 job again, and although uncertainty exists, they have the benefit of years of tooling experience and production know-how from World War II. However, it is a time-consuming job that will take months before mass production of military goods is under way. On the books of the automotive companies are orders totaling billions of dollars for defense supplies. A

partial list of the contracts was published in the March 15 issue of *AUTOMOTIVE INDUSTRIES*.

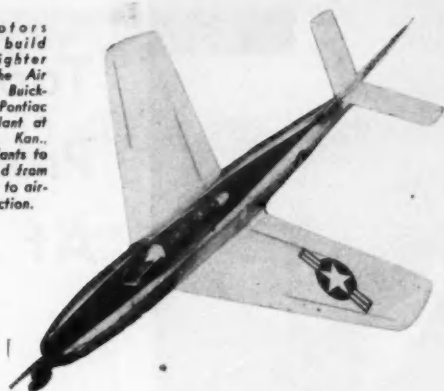
The predictions that motor vehicle production would fall sharply during the first quarter did not materialize. Instead the industry during the first three months of this year turned out just short of 2 million cars and trucks to set an all-time record for the period. Part of the reason for this amazingly good performance was that Chrysler was in production whereas last year it was idle during more than two thirds of the first quarter because of a strike. Another very important factor is that manufacturers have been digging into reserves of materials and parts built up during the late months of last year. In addition, Government restrictions were eased in several important respects from time to time enabling the industry to do a very

Many types of new equipment are required in tooling up of plants for defense production.



Because they were far too small to accommodate the 4000-hp Pratt and Whitney engines that Ford Motor Co. will build for the Air Force, 82 obsolete test cells at Ford's Rouge plant have been torn down to permit expansion of the Dearborn engine plant, which is being converted for making aircraft engine parts.

General Motors Corp. will build F-84F jet fighter planes for the Air Force in the Buick-Oldsmobile-Pontiac assembly plant at Kansas City, Kan., one of the plants to be converted from automobile to aircraft production.



No. 1 Job

By Leonard Westrate

good production job.

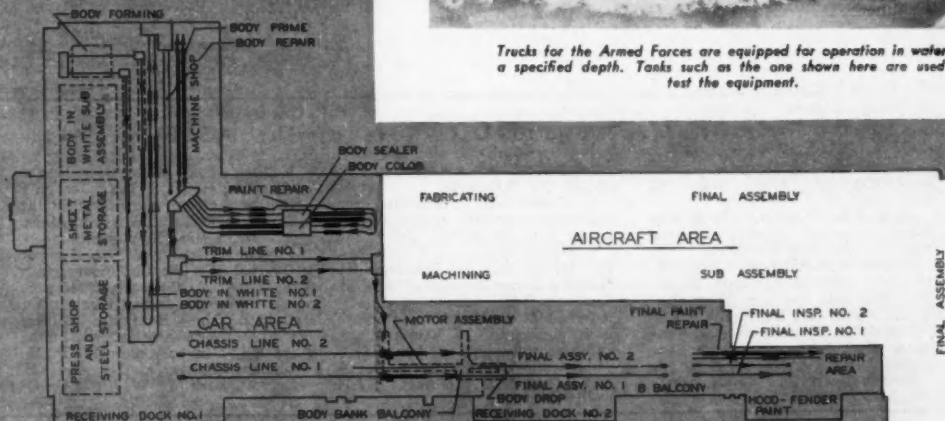
One factor that is complicating evaluation of civilian vehicle production is that the industry currently is turning out military cars and trucks on the same lines as civilian units, but the number is not revealed because of security reasons and is lumped into the grand production total. It is not believed, however, that these military vehicles turned out in the first quarter would account for anything

(Turn to page 104, please)

Plant layout at Willow Run for manufacturing Kaiser cars at current rate and C-119 Packets for the Air Force. Unshaded area in the illustration indicates approximate space for aircraft assembly.



Trucks for the Armed Forces are equipped for operation in water to a specified depth. Tanks such as the one shown here are used to test the equipment.





J. J. Demuth, newly-elected president of ASTE. Mr. Demuth succeeds Herbert L. Tigges, executive vice president, Baker Brothers, Toledo, Ohio, and consultant to NPA in Washington.

Tool Engineers Stress Production Know-How At Annual Meeting

Materiel, U. S. Air Force Headquarters, Washington, D. C., spoke on the importance of tooling for defense and discussed some of the problems in connection with the tooling program, together with their solutions (see next page).

Speaking at the annual dinner of the Society, R. F. V. Stanton, executive vice-president and general manager of American Machine and Foundry Co., Brooklyn, outlined the corrections which national leadership should make in its rearmament program. Mr. Stanton, a lieutenant colonel in the Ordnance reserve and former chief of Army Ordnance Small Arms Division at Hartford, called for a more accurate appraisal of existing circumstances by Government officials.

Technical sessions which commenced on the morning of Thursday, March 15, and continued daily through the morning of Saturday, March 17, were devoted to "production know-how," the theme of the meeting. They were designed to present the greatest amount of usable information as was possible within the two and one-half days available. Although four or five sessions were held simultaneously they were scheduled so that no two on the same general subject occurred at the same time.

The 33 papers presented surpassed in number the total for any previous ASTE meeting.

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DUE to the critical need for defense production, the 19th Annual Meeting of the American Society of Tool Engineers in New York City, March 14 to 17, was one of the most important events of its kind ever held by the Society.

Opening event of the four-day meeting was a Mobilization Technical Know-How Conference held during the evening of Wednesday, March 14. Lieutenant General Kenneth B. Wolfe, Deputy Chief of Staff for

New Officers and Directors of the ASTE

President—J. J. Demuth, general superintendent, Sligo, Inc., St. Louis, Mo.

First Vice-President—L. B. Bellamy, manager Detroit Branch, Sterling Grinding Wheel Co.

Second Vice-President—Roger F. Waindle, general manager, Industrial Products Division, Elgin National Watch Co., Elgin, Ill.

Third Vice-President—T. J. Donovan, Jr., owner, Donovan Co., Philadelphia, Pa.

Secretary—W. A. Thomas, super-

intendent of tool engineering, Ford Motor Co. of Canada.

Treasurer—H. C. McMillen, general superintendent, Seeger Refrigerator Co., Evansville, Ind.

Assistant Secretary-Treasurer—Dr. H. B. Osborn, Jr., technical director, Tocco Division of the Ohio Crankshaft Co., Cleveland, Ohio.

In addition to J. J. Demuth, L. B. Bellamy, T. J. Donovan, Jr., and the retiring president, H. L. Tigges, the following were elected to the board of directors: H. E.

Collins, chief tool engineer, Hughes Tool Co., Houston, Tex.; Joseph P. Crosby, vice-president, LaPointe Machine Tool Co., Hudson, Mass.; E. W. Ernst, superintendent, Punching Tool and Die Division, General Electric Co., Schenectady, N. Y.; G. A. Goodwin, chief process engineer, Master Electric Co., Dayton, Ohio; Benjamin J. Hazewinkel, representative, L. S. Starret Co., Denver, Colo.; W. F. McClellan, engineer, Gairing Tool Co., Detroit, Mich.

New Concepts for Defense Tooling

By Lt. General Kenneth B. Wolfe

Deputy Chief of Staff, Materiel, USAF

It is estimated by some economists that the production potential of the United States is 14 times that of most of the other countries of the world combined. Certainly the one way to tap this production potential in time of mobilization is through proper and adequate application of tool engineering, for while our natural resources and manpower are fixed, the ability of the American tool engineer's ingenuity to extend their effectiveness is limitless. In the Air Force we have recognized and appreciated the fact that one of the most important functions affecting aircraft production and expansibility are tooling and tool engineering.

At Wright Field in Dayton, Ohio, we have done considerable research in the field of tool design and planning, as well as the practical evaluation of actual fabrication and assembly methods. To show how important this problem appears to the Air Force, we are currently investing well over a million dollars in direct financing of straight-forward investigations in aircraft tooling. No other factor has more effect on ultimate cost and has more influence in determining elapsed time to peak production than the type tooling from which the article is produced.

Tooling techniques in the aircraft industry are somewhat different than those encountered in other established industries of comparable size. These differences may be attributed to some very well defined characteristics. In relative volume even mobilization demands for aircraft seldom approximate the high volumes associated with the automobile industry, which has established a world reputation for mass production techniques. The following comments illustrate the Air Force tooling problems and how the subject is being approached:

Varying tactical requirements for any given aircraft sometimes require a range of types, thus reducing scheduled production quantities to what approximates job lot orders. To take advantage of constantly changing scientific developments in aircraft design, which enables us to keep well ahead of the enemy, we must provide for engineering changes on relatively short notice.

These factors are also encountered in commercial enterprise to a certain degree; however, to further aggravate provisioning of volume production techniques in aircraft tooling we must keep in mind that for any major mobilization effort we will be faced with a critical time element as well as critical shortages in manpower and materials. We must provide a sound tooling program which will be applied to aircraft construction in as short lead time as possible. It must

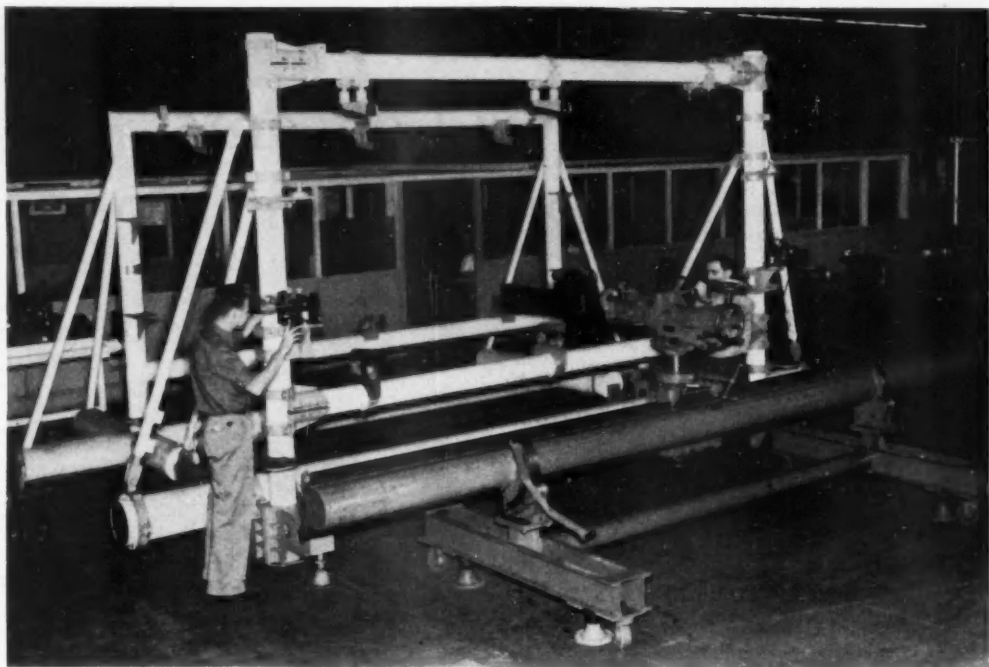
provide minimum work in process at our plants; maximum dimensional accuracy for interchangeability of parts under assembly conditions in the factory and for maintenance in the field.

From the standpoint of maintenance in the field, to cite an example, allowable run-out for a wing panel in the newer jets is 0.0625 in. in 18.5 ft. The tolerances throughout the airframe are correspondingly minute. This poses quite a burden on maintenance where simple wooden jigs were the former order. It is therefore necessary to equip even maintenance shops with sufficiently accurate jigs and fixtures to assure proper maintenance of mold lines, contours, and surfaces. This is an entirely new requirement in the field of maintenance.

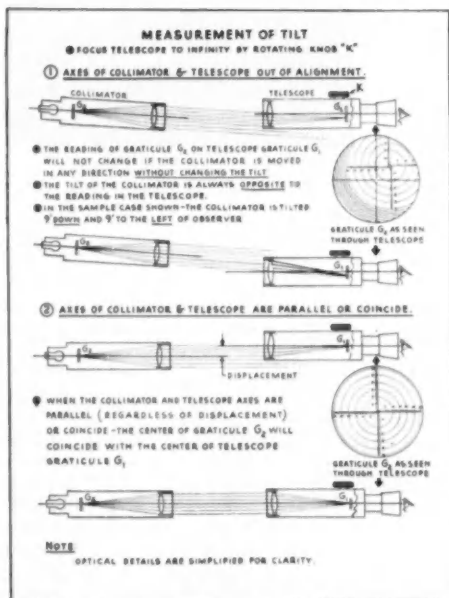
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Lieutenant General K. B. Wolfe



Optical Airframe Tooling, a



Bolted Joint Castings Replace Welded Construction, Lowering Costs and Permitting Quick Dismantling and Reassembly. Use of Optical System, Including Telescope and Collimator, Insures Accuracy and Avoids Dependence on Master Fixtures.

Fig. 2—Diagrams showing how axes of collimator and telescope are brought into alignment. Graticule is at focal plane of collimator lens.

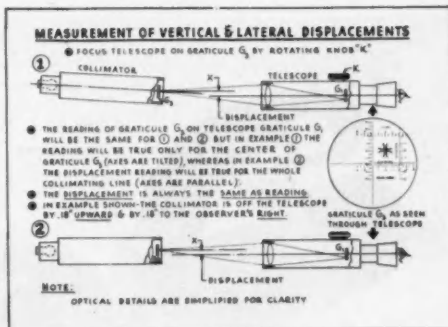
By A. Kastelowitz

Chief, Manufacturing Research
and Development, Republic Aviation Corp.

Fig. 1—Welded fixture (background) and the equivalent fixture provided with castings bolted at joints. A check is being made by use of a telescope on a fixed bracket and a collimator on the beam attached to the universal positioner.



Fig. 3—These diagrams illustrate method of measuring displacement. Graticule is located at outer end of collimator and serves as an illuminated target.



WHEREVER airframe assemblies are built in quantities on a truly interchangeable basis, it is essential that rigid and precise assembly fixtures be employed. As established airframe manufacturers do not have capacity to meet current or prospective needs, subcontract is necessary and even whole new plants must be established or converted to build on the scale required. This necessitates fixture duplication on a large scale and heretofore has required the making of master fixtures against which those employed on each job could be checked.

During the second world war, efforts to meet similar requirements met with great difficulties; and grave handicaps resulted, both in final assembly and in field service. In Germany, where a well integrated aircraft industry was built up before the war, as well as in other nations, including our own, great reliance was placed upon master fixtures. If these were damaged by bombing, transit or other hazards, serious delays occurred and other difficulties arose.

In Germany, means for avoiding or minimizing such handicaps included the use of underground fixture

New Assembly Technique

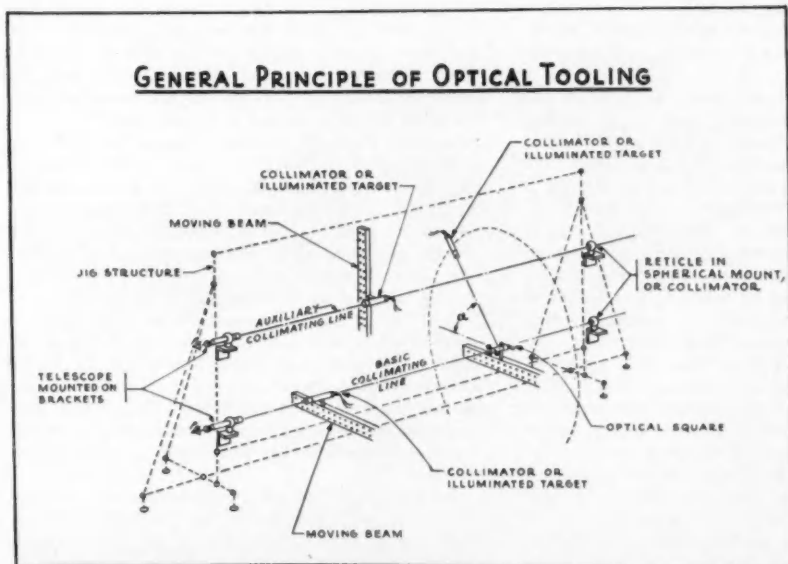
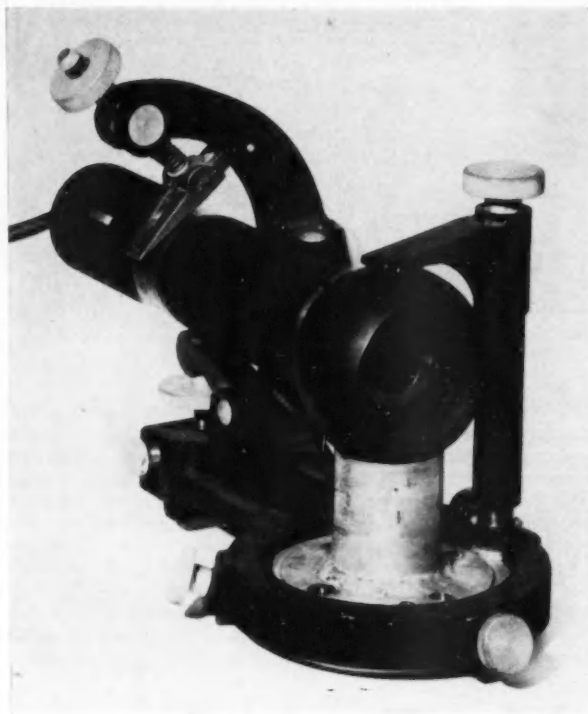


Fig. 4—Diagram illustrating the general principles of optical tooling. Dotted lines indicate the fixture structure with cast fittings (circles) at joints. Dot-and-dash lines are the collimating lines.



A NEW ASSEMBLY

Fig. 5—Adjustable alignment bracket designed to support a telescope or a collimator. This bracket fits over a socket having a spherical seat fitting the spherical ring on the telescope tube.

storage, but such steps were not adequately effective. The Germans, however, employed a type of fixture using demountable castings instead of welding at joints, and this construction yielded definite advantages with which some American aircraft engineers are familiar.

To meet current American needs, the Research and Development Section of Republic Aircraft Corp. undertook the project of developing standardized tooling to accelerate mobilization and increase production. Objectives included: Reduction in tooling as well as in product cost; improved precision; a type of design in demountable units capable of stockpiling and also of transport by air; erection simplicity such as to permit using inexperienced manpower; ease of checking without need for coordination by masters; and ability to provide both designs and know-how readily followed by contractors not experienced in aircraft work.

Republic engineers now have been able to meet all these objectives, although they are pursuing further work that will add to the utility of the system already developed. Objectives already attained are so important, however, that all production executives likely to engage in airframe construction should take advantage of the benefits attainable. It is not unlikely also that similar technique could be followed in building other large assemblies required on an interchangeable basis.

Heretofore, most large airframe assembly fixtures

have been fabricated by welding together tubing, often of large diameter. This makes a good structure, especially if welds are annealed, but has several major disadvantages; the fixture is expensive, cannot be dismantled without destroying the welds and, if changes are needed, welding on extra parts is likely to change critical dimensions, often making it necessary to recheck the whole fixture against a master. If a welded fixture must be shipped, it cannot be knocked down unless subsequently rebuilt.

Many of these disadvantages can be overcome by using a bolted assembly in which well-designed and interchangeable castings are used. Such castings are not expensive and need only simple machining, chiefly where they fit around the tubes joined, the castings being split for saddle-like mounting. Gray iron or semisteel, properly ribbed for stiffness, can be used. Base castings have a box-like section. Tests have shown that such castings provide fixtures of adequate stiffness and the fixtures suffer no more distortion when moved than do equivalent welded fixtures.

In addition and highly important, bolted fixtures can be taken apart quickly and then the components are easily shipped by air or otherwise and can be stockpiled in safe areas if necessary. Moreover, assembly can be done by inexperienced labor. Reassembly after dismantling is simple but requires that critical dimensions be rechecked, of course.

Both initial and subsequent checking can be done quickly, easily and with comparatively inexperienced labor, if properly supervised, because of the optical checking system developed when the fixtures here described were designed and built. This system provides greater precision than conventional systems and has the great advantage that master fixtures are not required.

Both a welded fixture (background) and a bolted fixture of equivalent design are pictured in Fig. 1. They are arranged for optical checking and the optical instruments are shown in place on the bolted fixture.

TECHNIQUE

Fig. 7—Drawing of welded fixture (above) and bolted fixture showing (in parentheses) the specified dimension and also the dimensions actually attained by conventional methods on the welded fixture and by optical methods on the bolted type.

The latter includes bolted brackets on which major checking instruments are mounted. Such brackets remain permanently on fixture uprights and, even though the instruments are removed when not needed, the brackets facilitate quick mounting and remounting for initial and rechecking purposes.

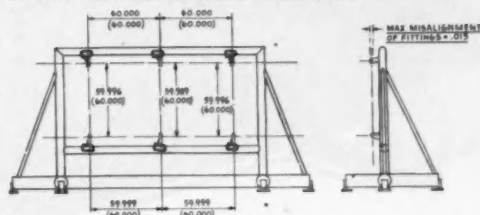
Also shown in Fig. 1 is a tubular support for a beam that is used in optical checking. This beam is bolted to an adjustable head that can be moved longitudinally along ways attached to a horizontal tubular support. Wheels on the head control vertical, transverse

(Turn to page 122, please)

COMPARATIVE TEST FOR ACCURACY (Figures shown in parentheses are the required dimensions)

CONVENTIONAL METHOD OF SETTING JIG POINTS

THE BRACING OF THESE FITTINGS USING STANDARD SCALES CAN BE HELD WITHIN 2.010. IN THIS CASE THE LINEAR BRACING OF THESE FITTINGS WAS ACCOMPLISHED BY USE OF THE OPTICAL SYSTEM MEASURING AIDS FOR THE PURPOSE OF AN ADDITIONAL CHECK ON THEIR ACCURACY.



UNIVERSAL OPTICAL POSITIONER METHOD OF SETTING JIG POINTS

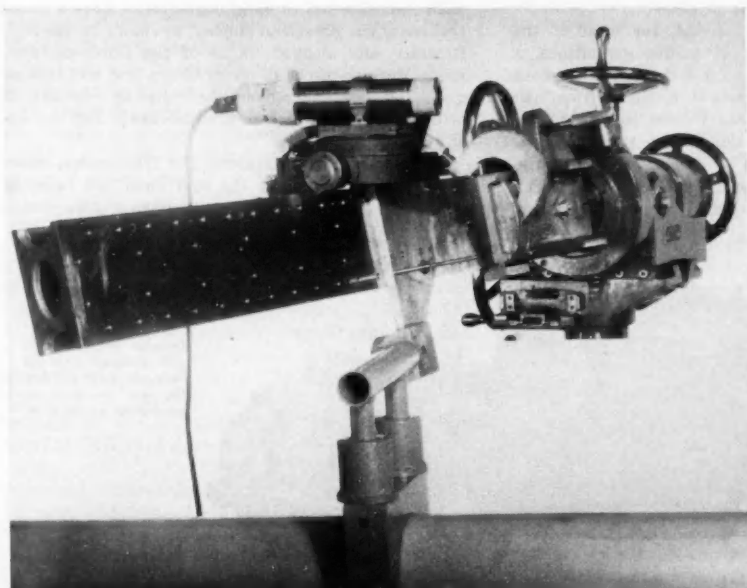
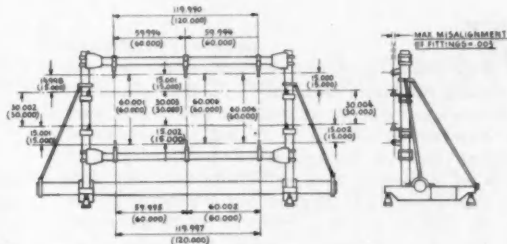
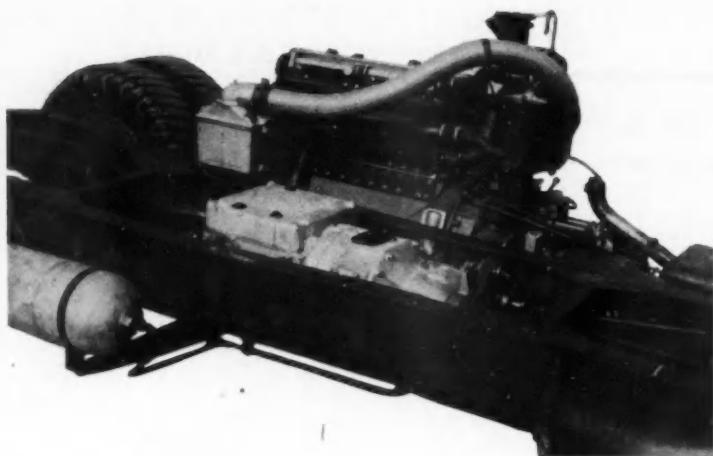


Fig. 6—Setup of collimator on the universal positioning beam by which a fixture fitting is held in correct location while the pins extending from the fitting are permanently fastened by pouring molten Corratru in the cups around the pins.



The Saurer Diesel engine is mounted outside the frame rail with the transmission located inside the frame.

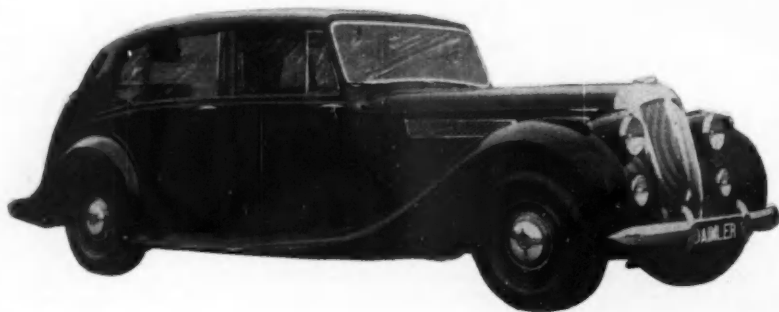
WITH every European nation represented and with many exhibitors from the U. S., the Swiss show at Geneva was one of the largest ever held. Floor space was increased to 170,000 sq ft and the number of makes of trucks on display rose to 53. There were 73 makes of passenger cars exhibited; two less than were shown last year. England and the United States had the leading positions, particularly in passenger cars but every European nation was represented. Russia reserved a stand for the Moskvitch, but for some unexplained reason this copy of the German Opel 1939 Cadette failed to put in an appearance, although it had already been shown at Brussels.

More commercial than technical, for most of the new models had been seen at earlier exhibitions, a strong effort was made to attract the buyer in what is one of the few open markets in Europe. American makers appealed to European buyers more strongly than usual by sectioned engines and transmissions. Packard had diagrams and a cutaway model of the Ultramatic drive. Ford showed a cutaway six cylinder valve in head engine as well as a working model of

1951

the front suspension. Chevrolet had a cutaway working model of the Powerglide transmission. Oldsmobile showed a polished Rocket engine with the Hydramatic transmission. Chrysler had a cutaway model of the V-8 Firepower engine. General Motors had a big grouped stand showing Vauxhall, Opel, Oldsmobile, Buick, Chevrolet and Cadillac models. With European requirements in view, convertibles were a strong feature of the American display, as shown by the Nash Rambler, and Dodge. Some of the European firms producing one-piece, all-metal bodies had met this demand for open and convertible bodies by custom-built bodies specially stiffened to compensate for the loss of rigidity.

With a few rare exceptions, the 1951 models shown to the Swiss public for the first time had been uncovered at Paris, London, or Brussels. Alfa Romeo



Daimler straight eight with Hooper limousine body. Priced at \$17,640, this was the most expensive car at the show.

Alfa-Romeo 1900 model with four-cylinder engine. It is said to have a top speed of 115 mph.



International Auto Salon

showed a sports version of the four-cylinder, twin overhead camshaft 1900 model. With two carburetors and higher compression ratio a speed of 115 mph is obtained. The model shown had a close-coupled, two-door four-passenger body built by Touring.

The Marauder, built in England with Rover 75 engine and suspension, made its first public appearance as a smart two-passenger runabout, deliveries of which are scheduled for June. This has the Rover four cylinder, 146 cu in. engine with a special head and three carburetors, developing 105 hp at 5000 rpm. Another version has the stock engine. Jaguar exhibited for the first time a closed two-passenger sports model on the XK120 chassis.

Among the French firms Salmson had a new four cylinder model with twin overhead camshafts, a Cotal electro-magnetic transmission and a light-alloy sedan body. Renault's line was the new four-cylinder Frigate of 122 cu in. piston displacement, which will not be in production until about October. Peugeot exhibited the sedan which had just completed a record trip across Africa, from Cape Town to Algiers, in 16½ days. Hotchkiss had adopted the Cotal electro-magnetic transmission for all models except the front-wheel drive, light alloy Gregoire, planned to be on the market in June.

German participation was considerably increased this year. Volkswagen headed the list with a production last year of 82,399 units. The display comprised a sectioned chassis of the rear-engine four cylinder model, a custom-built, four-passenger convertible, a

standard sedan and, in the commercial vehicle section, a delivery van and a bus using the passenger car engine. In second position came Opel (General Motors) with a production last year of 60,000 units, displaying a four and a six, the Olympia and the Capitaine, of the same bore and the same general lines of construction. The four cylinder model, intended for export, has had its compression ratio increased to 6.6 to 1, the output thus being increased to 47 hp at 4000 rpm.

Super-balloon tires are fitted and the final gear ratio has been modified. Some changes have been made in the styling. For the six cylinder model the compression ratio has been increased to 6.75 to 1, with an output of 67 hp at 3900 rpm. Telescopic shock absorbers

at the rear, a stabilizer bar in front, brake drums stiffened by a fin and some detail changes in styling have been applied to the Capitaine.

Mercedes apparently had made no changes in the passenger car model. There was a pronounced tendency towards economical operation in the German section by the use of small engines, generally with front wheel drive, some of these being of the two-stroke variety. Gutbrod exhibited a central backbone chassis with a forked front end carrying a water-cooled two-cylinder, two-stroke engine of 36 cu in. and driving to the front wheels through a three-speed transmission. Front wheels had independent suspension and coil springs were used all round.

The Goliath came into the same class with a two-cylinder, two-stroke engine of 42 cu in. piston displacement
(Turn to page 111, please)

By W. F. Bradley

Special European Correspondent
For AUTOMOTIVE INDUSTRIES

Engineering Analysis of 1951 Economy Run

By Wilmot Sandham

Automotive Engineer,
General Petroleum Corp.

TOPPING a field of 32 1951-model automobiles of nearly every make, a Lincoln sedan driven by Les Viland was the sweepstakes trophy in the 1951 Mobilgas Economy Run with a ton-mile mark of 66.484 mpg and an actual average of 25.448 mpg for the 840-mile roundabout course from Los Angeles to the south rim of Grand Canyon (see Feb. 15, page 56, AUTOMOTIVE INDUSTRIES).

The entire field of cars, varying from the four-

cylinder Henry J to the Chrysler Crown Imperial limousine, averaged 23.923 mpg. Their average speed was 40.6 mph.

Automotive engineers will note with interest the large number of ton miles per gallon and miles per gallon secured by the newly-designed, high-output engines as compared to the older type engines still being used in other cars of their own manufacture. Some cars of the same displacement as last year have shown a considerable increase in economy, which can probably be completely attributed to improvements in carburetion, ignition and manifolding, for the course selected by the AAA Contest Board this year was longer and was considerably more severe than the course of last year. In spite of the more difficult course, all cars this year showed an average of 1.853

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Final Results-1951 Mobilgas Economy Run

Class	Make and Model	Place	Miles Per Gallon	Ton Miles Per Gal.	Type of Drive	Type of Fuel†
A	Chevrolet Styleline	5	22.041	45.956	Conventional	M
	Ford Six	3	25.915	53.838	Overdrive	M
	Ford Eight	1	25.994	54.587	Overdrive	M
	Plymouth Cranbrook	4	22.990	47.934	Conventional	M Sp.
	Studebaker Champion	2	28.621	54.321	Overdrive	M Sp.
B	Nash Statesman	2	26.122	52.637	Overdrive	M Sp.
	Studebaker Commander	1	28.001	58.173	Overdrive	M
C	De Soto Deluxe	5	21.622	51.135	Conventional	M Sp.
	Mercury	1	25.945	59.868	Overdrive	M Sp.
	Studebaker Land Cruiser	2	27.644	58.744	Overdrive	M
	Kaiser Deluxe	4	24.713	52.828	Overdrive	M Sp.
	Nash Ambassador	3	24.926	58.268	Overdrive	M Sp.
D	De Soto Custom	3	19.921	47.760	Tip Toe Shift	M Sp.
	Chrysler Windsor	2	20.886	52.268	Presto-matic	M Sp.
	Packard "200"	1	22.023	53.020	Overdrive	M Sp.
	Hudson Commodore Six	4	19.590	46.723	Overdrive	M Sp.
E	Hudson Hornet Six	2	22.623	53.785	Overdrive	M
	Lincoln	1*	25.448	66.484	Overdrive	M Sp.
F	Packard "300"	2	20.941	52.196	Overdrive	M Sp.
	Cadillac Series "61"	1	21.719	55.492	Hydra-matic	M Sp.
G	Chrysler Imperial	1	21.178	59.457	Presto-matic	M Sp.
	Cadillac Series "62"	2	21.531	56.412	Hydra-matic	M Sp.
	Lincoln Cosmopolitan	3	17.123	47.601	Hydra-matic	M Sp.
H	Cadillac Series "60" Special	1	21.979	58.795	Hydra-matic	M Sp.
I	Cadillac Series "75"	2	19.869	58.513	Hydra-matic	M Sp.
	Chrysler Crown Imperial	1	19.208	63.289	Fluid-Torque Drive	M Sp.
Special Lightweight 4-Cyl. Class						
	Henry J	1	30.109	49.153	Overdrive	M Sp.
	Willys	2	26.769	46.110	Overdrive	M Sp.
Special Lightweight 6-Cyl. Class						
	Henry J	3	28.860	48.340	Overdrive	M Sp.
	Willys	4	24.973	43.266	Overdrive	M
	Nash Rambler	1	31.053	53.489	Overdrive	M Sp.
	Plymouth Concord	2	24.145	48.954	Conventional	M Sp.

* Sweepstakes Winner—First Place, Lincoln. † M—Mobilgas Regular. M Sp.—Mobilgas Special.

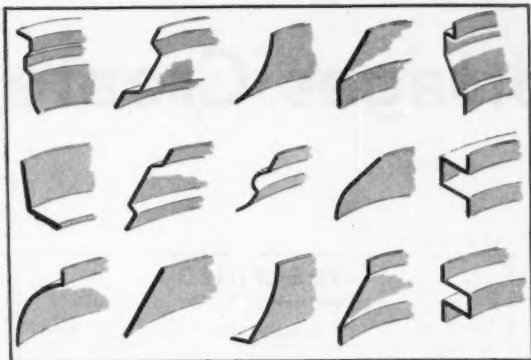


Fig. 1—Illustrated here are several typical cross-sections of metal strips, utilized for jet-plane parts, that are processed by the contour forming method.

Contour Forming Parts for Jet Engines

JET engine assemblies require many types of dimensionally accurate rings, half circles, and segments in stainless steel, aluminum alloy and some special alloys. These parts are used as flange rings, shrouds, cases, flame tubes, stiffeners, casings and other circular members. Since World War II, many of these units have been formed by the stretch process on the circular tables of Bath Universal contour formers.

The basic method of production on a contour former consists of gripping the material to be formed in a pair of gripper jaws, using the main hydraulic cylinder of the machine to stretch the material to its elastic limit and revolving the material on a cylindrical or spiral die. Material thus

formed follows the curvature of the die with the necessary accuracy required in certain jet components. Closer tolerances can be obtained, for example, with high alloy stainless steel sheet if it is formed while stretched.

By contour forming, it is possible to produce parts not suitable for rolling because of the character of the metal, the unbalanced cross section of the part and the variation in material elongation required at different diameters of the part. Fig. 1 illustrates a number of shapes that are typical of this type of production. These are really rotary draw operations, the blank being a straight strip.

A very simple jet shroud made from a stainless steel strip requiring approximately 200 deg of curvature is shown being formed in Fig. 2. A conical shape is imparted to the material and close accuracy is maintained with respect to flatness, angularity and concentricity. Many shrouds of this type have been produced in volume runs in smaller as well as larger diameters, involving much more severe taper and much wider bands of metal.

Fig. 3 illustrates the application of a spiral die. This procedure is sometimes employed to form circular components.

By modified tooling, parts of many complicated characteristics and cross section can be made.

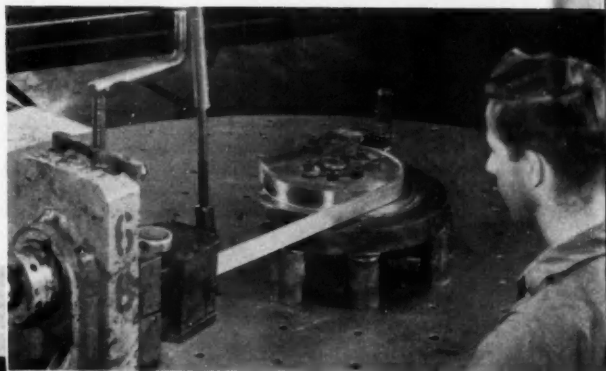


Fig. 2—Jet aircraft shrouds are formed to a 200 deg curvature by the use of a cylindrical die on this Bath Universal contour former.



Fig. 3—Shroud rings that must be formed into a complete circle are produced on a spiral die.

Metals Shortages Create

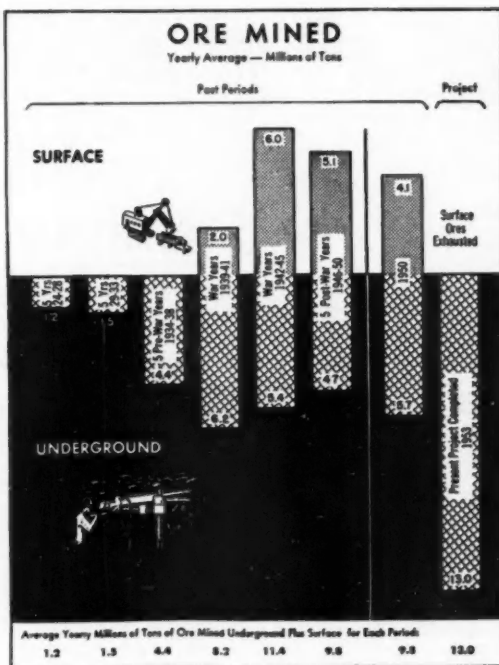
OF the many uncertainties now plaguing the automotive industries, metals and alloys — ferrous and non-ferrous — play the major role in determining how much product can be built and for how long. Current shortages and restrictions already have brought hardships in many directions, and have encouraged some off-color metal and chemical market deals tinged from light grays to black.

At the recent SAE National Meeting held in Detroit, C. E. Smith, reporting on ferrous materials and R. J. Lund on non-ferrous, indicated that in many cases the supply of basic metals and alloys is inadequate even for civilian demand largely because of short sighted governmental policies. For example, Lund stated that the domestic supply of non-ferrous metals would have been in far better shape today had fiscal policies in the past encouraged greater capital risks in exploration and development. Instead, such operations have actually been reduced by as much as 95 per cent.

What is the materials situations at this writing? Not even the best informed people in their own fields have a clear answer. So much depends upon a realistic estimate of actual needs of the military program. How far must the domestic economy be bled to supply the rest of the world? Are we in for a period of military preparedness or is all-out war imminent? These are the basic questions. They will affect all planning and yet they are unknown quantities so far as industry is concerned.

What about stockpiling? Many critical materials and ingredients have gone to war on the stockpile. Is the stockpile to be frozen against future emergencies or will it constitute banks against which military contracts will draw their supplies for immediate production when ready to go? In the latter case the situation will ease later on since it will be necessary only to keep the pipeline filled as withdrawals are made. If the stockpile is frozen, we face an impossible situation since more and more critical materials must be siphoned off to keep military production going.

The outlook for civilian steel certainly is bleak considering the cut-backs already in effect and with the prospect of more to follow. Even worse is the effect of restrictions on the basic alloys required for alloy steel making—nickel, and molybdenum particularly. To meet this challenge the steel producers in cooperation with the users are shifting to low carbon steels, manganese steel, more recently to boron-treated steels,



The above chart shows how completion of the expansion program initiated in 1937 with more than double International Nickel Company's underground ore production replacing ore from the open pit which is almost exhausted.

and the triple-alloy steels. In any event, the emphasis from now on will be on hardenability rather than chemistry.

Nickel touches practically everything in our civilian and military economy. Basic in alloy steels, stainless steels, alloy irons, and many varieties of heat resisting alloys, it is also indispensable for electroplating. Shorn of nickel, the automotive foundries must seek other means for improving cast iron; in the steel making field, entirely new alloys must be developed and exploited to take the place of nickel for high-strength structural materials.

For purely decorative purposes automotive producers must fall back on chromium-rich stainless steels to replace the wanted nickel bearing stainless alloys for moldings, window reveals, radiator grilles, and the

Many Production Problems

By Joseph Geschelin

like. Some of these have the disadvantage of being less formable than 18-8 stainless and might require sectional redesign for economical forming.

Taking nickel out of chromium plated coatings poses a serious problem. Consideration is being given to the plating of die castings for hardware and other parts by using a deposit of copper on the base metal, followed by the usual chromium flash. The life of such electroplate is questionable. If the situation grows worse, many decorative elements such as radiator grilles, could be made of light gage sheet steel and painted. But, what about bumpers and bumper guards? It is questionable whether those units will resist corrosion without specification chromium plate.

International Nickel Co. reports that the enormous output of nickel in 1950—256 million lb—was the result of increasing output and drawing upon reserve stocks. From now on we must look to maximum exploitation of underground mining operations as well as the solution to mining and metallurgical problems incident to the recovery of lower grade ores. Barring unforeseen interruptions, full conversion to underground mining is anticipated in 1953 by which time the visible supply of surface ores will have been completely exhausted.

When molybdenum is mentioned, the first thing that comes to mind is that we have a plentiful supply

(Turn to page 116, please)

The 80Bxx series is designed to have hardenability equivalent to the 86xx steels at the same carbon content. The 81Bxx series is likewise designed to have hardenability equivalent to the 41xx steels at the same carbon content. 94B17 is designed to have hardenability equivalent to 4820. These new steels can be expected to have 0.0005 per cent minimum boron content.

New Steels Containing Boron Developed to Conserve Manganese, Nickel, Chromium and Molybdenum

80Bxx
Chemical Composition Limits, per cent

Grade	C	Mn	Si	Ni	Cr	Mo
80B20	0.17/0.23	0.45/0.70	0.20/0.35	0.20/0.40	0.15/0.35	0.08/0.15
80B25	0.21/0.28	0.50/0.75	0.20/0.35	0.20/0.40	0.15/0.35	0.08/0.15
80B30	0.27/0.34	0.55/0.80	0.20/0.35	0.20/0.40	0.15/0.35	0.08/0.15
80B35	0.32/0.39	0.65/0.95	0.20/0.35	0.20/0.40	0.15/0.35	0.08/0.15
80B40	0.37/0.45	0.70/1.00	0.20/0.35	0.20/0.40	0.15/0.35	0.08/0.15
80B45	0.42/0.50	0.70/1.00	0.20/0.35	0.20/0.40	0.15/0.35	0.08/0.15
80B50	0.47/0.55	0.70/1.00	0.20/0.35	0.20/0.40	0.25/0.50	0.08/0.15
80B55	0.50/0.60	0.70/1.00	0.20/0.35	0.20/0.40	0.30/0.55	0.08/0.15
80B60	0.55/0.65	0.70/1.00	0.20/0.35	0.20/0.40	0.30/0.55	0.08/0.15

81Bxx
Chemical Composition Limits, per cent

Grade	C	Mn	Si	Ni	Cr	Mo
81B35	0.32/0.39	0.70/1.00	0.20/0.35	0.20/0.40	0.30/0.55	0.08/0.15
81B40	0.37/0.45	0.70/1.00	0.20/0.35	0.20/0.40	0.30/0.55	0.08/0.15
81B45	0.42/0.50	0.70/1.00	0.20/0.35	0.20/0.40	0.30/0.55	0.08/0.15
81B50	0.47/0.55	0.75/1.05	0.20/0.35	0.20/0.40	0.35/0.60	0.08/0.15

94Bxx
Chemical Composition Limits, per cent

Grade	C	Mn	Si	Ni	Cr	Mo
94B17	0.14/0.20	0.70/1.00	0.20/0.35	0.30/0.60	0.30/0.55	0.08/0.15

McCulloch Tandem-Rotor Helicopter

A PRODUCTION prototype of the MC-4 helicopter has just been completed by the McCulloch Motors Corp., Los Angeles, Calif., after approximately two years of intensive research and development.

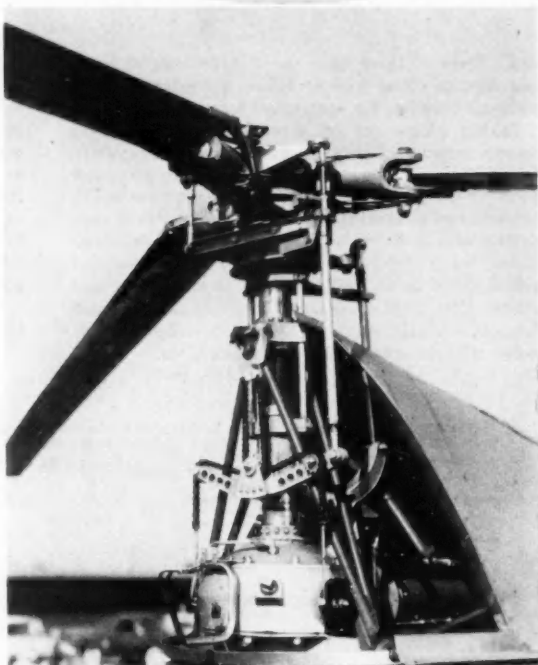
The craft was designed primarily for the civilian market for such purposes as crop spraying, pipe line patrol, forest fire spotting, and pilot training. However, the firm has received a contract from the Navy Bureau of Aeronautics to build MC-4's for evaluation tests.

This new two-place helicopter utilizes tandem-mounted, intermeshing rotors — a total of six rotor-blades — powered by a 165-hp, six-cyl, aircooled horizontal engine.

(Turn to page 140, please)

(Right) This view shows the drive mechanism for the forward rotor of the new McCulloch Motors Corp. two-place helicopter.

(Below) The craft has a 165-hp, six-cyl, aircooled horizontal engine installed at the rear. Ten belts, shown to the rear of the engine, transmit power from the engine to an overhead main drive shaft which in turn drives the reduction gearing for the rotors.



Specifications and estimated performance figures

ESTIMATED PERFORMANCE

High speed at sea level	100 mph
Operating speed, sea level, 75% power	85 mph
Service ceiling	16,000 ft
Hovering ceiling	6000 ft
Vertical rate of climb, sea level	675 fpm
Maximum rate of climb, sea level	1520 fpm
Time to climb 10,000 ft	9 min
Range at operating speed	260 miles
Maximum endurance	4¼ hr
Landing speed, power on	0 mph
Landing speed, power off	30 mph

SPECIFICATIONS

Weight empty	1200 lb
Useful load	600 lb
Gross weight	1800 lb
Over-all length	32 ft, 5 in.
Over-all height	9 ft, 1 in.
Span (rotor diam)	22 ft



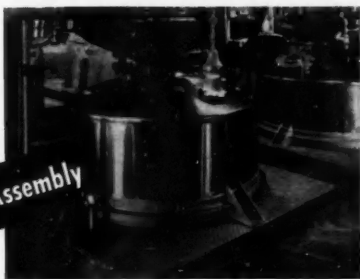


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The BUSINESS PULSE

General Price Level Now in an Irregular Trend; Pressures Are Easing in Non-Durable Goods Field; New Construction Sets Record for February and New Plant and Equipment Outlay to Reach \$24 Billion in 1951.

Tendency Toward Stability

The rapid advance in the volume of business and the steady increase in prices which were becoming characteristic of the economy during the summer and early winter appear to have slackened somewhat in recent weeks. There is a noticeable tendency toward relative stability. The general price level has continued to move upward, but the swift and steady advance of recent months has given way, for the time being at least, to a much more irregular trend. Though most of the durable-goods industries are still taxing their facilities in an effort to keep up with demand, in other sectors of industry demand pressures seemed to have eased off. Among the nondurable there are instances in which inventory accumulation, combined with an apparent subsidence of the buying wave, has created a situation that is interpreted in some quarters as foreshadowing the reappearance of a buyers' market.

The effects of Defense requirements on most of the industries producing goods for civilian use are not yet severe, although they are gradually becoming more pronounced. Production of passenger automobiles and trucks reached an all-time record in the first quarter of this year. New construction in February approached the two-billion-dollar level, the highest February figure on record, despite earlier predictions of a sharp decline. Current forecasts, however, are still on the conservative side. Plans for new plant and equipment in 1951 indicate that total outlay will rise to about \$24 billion, 29 per cent above the 1950 total. A consequence of the past nine months' advance in industrial activity is the continuing high level of imports, which in January rose to the record figure of \$1,022 million.

The Labor Boycott

Stabilizers in Washington continue to wrestle with a set of practical problems that have not yet been satisfactorily solved. Among the most difficult of these,

apparently, is the thorny question of how the demands and aspiration of organized labor are to be reconciled with the vital needs of the national rearmament effort. The general withdrawal of labor representatives from Federal mobilization agencies at the end of February was followed by a period of confusion, of charges and counter-charges, in which not even the nature of the issues seemed to be agreed upon. Labor leaders apparently viewed the dispute as the culmination of a long record of grievances, while the Mobilization Director reportedly believed the disagreement arose primarily over the allocation of manpower. The labor boycott continued to April 5 when labor leaders agreed to serve on a new mobilization advisory board.

Questions have also arisen in connection with "escalator" clauses in labor contracts—the provision for automatic wage increases with advances in the cost of living. Rulings by the Economic Stabilizer permitting such wage increases clearly set up wage differentials between employees who were covered by escalator clauses on the January 25 deadline and those who were not. The question has naturally been asked whether such differ-

entials can be maintained, especially if subsequent price movements should make them very substantial. In addition, there remains the older question whether such clauses in general can be permitted to operate without perpetuating the wage-price spiral. The latter question is highlighted by the Bureau of Labor Statistics' report that its revised consumers' price index for January 15 had reached a new peak at 181.5 per cent of the 1935-39 average, thereby entitling more than a million workers to wage increases of from four to five cents an hour under escalator clauses, with a further advance to 183.8 in mid-February.

Price Control Problem

The mounting food prices that are a major factor in the rise in the cost of living are in turn due to another feature of the existing stabilization program
(Turn to page 96, please)

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Torrington Needle Bearings require a minimum of maintenance...operate smoothly and efficiently for long periods without attention.

Lubricant is effectively retained by the turned-in lips of the outer shell, which also help to seal out dust, moisture and other foreign matter. An even film of grease or oil is spread over all bearing contact surfaces by the full complement of small diameter rollers.

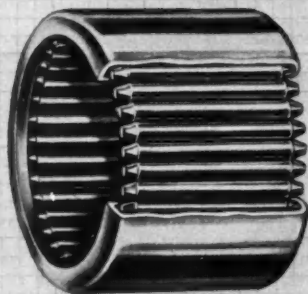
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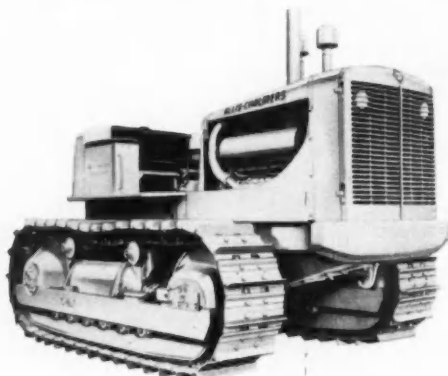


TORRINGTON *NEEDLE* BEARINGS

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Three New Crawler Tractors

The Model HD-20 tractor which is equipped with a hydraulic torque converter and hydraulically controlled steering clutches.



THREE new crawler tractors have been added to the Allis-Chalmers line. Known as the HD-9, HD-15 and HD-20, the units are being produced at the company's expanded Springfield, Ill., Works.

Models HD-9 and HD-15 have constant mesh transmissions, with separate reverse gears, arranged so that a shift may be made to reverse while in any ratio. Model HD-20 is equipped within a Twin-Disc hydraulic torque converter and a transmission that provides two forward speed ranges and one reverse.

General Motors two-stroke Diesels power all three of the new tractors. The HD-9, which weighs 18,500 lb, has a drawbar rating of 70 hp. The HD-15 weighs 27,500 lb and develops 102 hp at the drawbar. Maximum drawbar pull of the HD-20, based on zero track slippage, is 65,000 lb in low range and 32,000 lb in high range. Speed of this model is 0-3 mph in low gear range, and 0-7 mph in high gear range. Net horsepower at the flywheel of its 660 cu in. engine is 175.

Positive seals in final drive; truck wheels, idlers, and support rollers are features of the new line.

ASTE Annual Meeting

(Continued from page 36)

A new pressworking process which can save up to 15 per cent of scarce sheet steel—and also accelerate production—was described by Melvin and Dan Verson, of Verson Allsteel Press Co., Chicago. Ordinarily, when stamped parts require several operations for completion, it was pointed out, these operations are divided among as many different stamping dies and presses, or they are performed in successive stages in the same die. In the latter case a strip of steel is fed into the press and the part is formed from the strip as it moves from step to step through the die. In the last stage the finished part is cut from the strip and the part of the strip which carried the piece is cut up into scrap. As much as 15 per cent of the steel was wasted this way.

By using "mechanical hands" to move the part from die to die, the new presses eliminate the conventional scrap strip and thus use nearly all the material. The new transfer presses have been built with bed lengths up to 11 ft and are capable of up to 450 tons pressure.

G. J. Seranton, manager of the Standards and Methods Dept., Quality Control Manufacturing Staff, Ford Motor Co., Detroit, presented the company's views and procedures in the administration of product quality control. The Ford executive gave the tool

engineers a complete analysis of his company's methods of controlling quality, and insuring progress. The man at the machine holds the key to quality, Mr. Seranton said, but deep personal interest all the way down the line is vital.

Industry hasn't even begun to reach the speeds at which metals can be machined with carbide tools, according to W. R. Coomey, general superintendent of Rice Barton Corp., Worcester, Mass. New machine tools can be developed to operate several times as fast and turn out from two to ten times as much defense materiel per machine. This belief was based on experimental evidence compiled by Mr. Coomey's organization.

The Rice Barton tests indicate that speeds at which the cutting tool moves through the steel at 16 mph or better are entirely feasible. Main requirements, according to Mr. Coomey, are machines capable of the required speed and feed combinations.

If speeds and feeds are increased even beyond the point where tools begin to fail from the speed being too high, Mr. Coomey said, good tool life will return and the horsepower required will be reduced.

Mr. Coomey cited several supporting experimental examples. In one, milling

cutter and workpiece remained cool at 1435 fpm, with 0.020-in. feed per tooth. When the feed was reduced to one-tenth of this, both workpiece and cutter became too hot to touch, indicating that the decrease in feed was detrimental to tool life. In another test a planing machine consumed 92 hp when cutting steel at 100 fpm; when the speed was tripled, power consumption went down to 55 hp.

Dr. W. R. Frazer of Union Twist Drill Co., Athol, Mass., told how productivity can be increased on older machine tools which cannot utilize the superior cutting properties of carbides. New grades of high-speed steel which contain ultra-hard carbides have been developed which will accelerate performance from such machines.

The new tool steels, which Dr. Frazer termed super-high-speed steels, contain vanadium carbide and molybdenum carbide particles. These particles, particularly the vanadium carbide, range up to Rockwell 85c in hardness. While the average hardness of the steel is much less than tungsten carbides, the presence of the hard particles enhances tool performance and life.

The new steels allow tools to be ground to comparatively sharp angles (60 deg). This reduces the power and rigidity required in the machine tool.



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By ROBERT McLARREN

Changing Strategy

All the Boeing bombers in service, and that means our entire medium bomber force of B-47, B-50 and B-29 types, are to be equipped with in-flight refueling equipment. Successful initial tests of the B-47 Stratojet transonic bomber in mid-air refueling points toward a significant change in the basic USAF global strategy. Since 1946 the Air Force has pointed vehemently at the huge Convair B-36 as our primary strategic air weapon capable of atom-bombing Moscow, but over the past few years in-flight refueling of our smaller, faster bombers has been developed rapidly. This could mean that the loudly-advertised "polar concept" has now given way to a concept based on the hit-and-run attacks of very highspeed medium bombers around the periphery of Russia, and Russian-held territory. The B-36, oddly enough, remains the only Air Force bomber not equipped for in-flight refueling. Supporting this new concept is the intensive Air Force activity in acquiring sites and building bomber bases in Tripoli, Morocco and Dhahran and the current negotiations for bomber sites throughout France. It may yet turn out that our "big stick," the B-36, has been only a mask to blind the Air Force's secret plan to use transonic atom-laden bombers for highspeed thrusts inside Russia, while her fighters and radar installations fruitlessly watch the Arctic for signs of approaching six-engined B-36's!

No Personal Aircraft Comeback

Preliminary estimates, based on the first 10-11 months of 1950, indicated that personal aircraft production rose during the year for the first time since 1946 and widespread speculation had it that the light-plane was staging a comeback after all. Final, official tally of the Department of Commerce, however, should dispel this optimism. A total of 3391 personal aircraft was produced during 1950, compared with 3379 in 1949. This difference of 12 airplanes hardly indicates a comeback of any kind. Personal aircraft costs continued to rise with the value of the 1950 production being \$18,616,000 compared with \$16,101,000 for 1949. The 1950 total volume of personal aircraft production is the equivalent of three Convair B-36 bombers with associated equipment, a rather graphic indication of the relative economic significance in the industry of the two kinds of aircraft.

Turbojet Cheap Power

Along with the many other claims made for it in January, 1945, the turbojet engine was claimed "much

cheaper to build" in quantity production. The years rolled by rather swiftly and quantity production came slowly but Allison Division, General Motors, recently delivered its 10,000th turbojet engine and that amount of production has, indeed, produced an engine that is cheaper to build. From an initial price of \$14.50 per pound of takeoff thrust, Allison has reduced the cost of its J33 engine to only \$4 per pound of takeoff thrust. Based on available figures, this would indicate a tag of about \$54,000 on its early engines, compared to \$21,000 on its current models, which have increased 40 per cent in takeoff thrust rating. This is less than one-half the cost of a reciprocating engine producing the same amount of power.

Full Maturity

And speaking of turbojet engine progress, it is also of interest to note that the authorized time between overhauls of the Allison J33 turbojet engine is now 500 hours. The significance of this is usually lost when it is compared with the 1000-1500 hour overhaul times approved for piston engines in airline use. What is overlooked is that piston engines in combat use also have an overhaul period of only 500 hours—not the 1000-1500 hours of leisure airline operation. That means that the turbojet engine has now reached full equality with the piston engine in the field, and after only six years of development work. The turbojet engine had to be overhauled every 20 hours back in 1945.

Integral Stiffening

Lockheed Aircraft's research program on integrally-stiffened panels of the past three years is now finding its first fruit in the form of integrally-stiffened lower surfaces on the wing panels of the new Super Constellation. The new fabricating method consists of milling thin, closely-spaced stiffeners into a slab of aluminum alloy one-inch thick, four feet wide and 32 feet long. By thereby eliminating a variety of splices, 111 separate parts and 3000 rivets, Lockheed saves 25 per cent of the weight of the parts redesigned and produces a stronger, stiffer wing. The new method is still experimental, of course, and Lockheed engineers frankly admit that there is no actual dollar savings as yet due to the waste material milled from the plate and the expensive equipment and manhours used for the job. However, the elimination in the future of the many jigs and fixtures on present extruded stiffener wings, the manhours required and the loss in aircraft performance through skin wrinkling in flight, are cer-

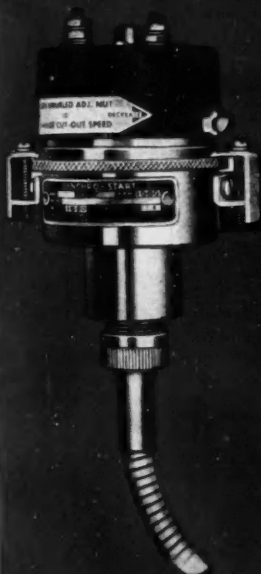
(Turn to page 118, please)

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**SYNCHRO-START
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For Tachometer Drive Take-off



This Governor can easily be mounted at any location and driven by a standard S. A. E. Heavy Duty Flexible Shaft connected to the tachometer take-off.

It has a single pole double-throw switch enclosed in the cap for either Automatic re-set (Model GFA) or Manual re-set (Model GFM) with contact capacity of 10A at 125V non-inductive load. The rotating parts run in Sealed Ball Bearings lubricated for life and the entire unit is weather-proof.

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Speed can be adjusted to 20% over or under the ordered shut down speed while the engine is running. Ask for Bulletin 409-A or our catalog #4 describing our full line of Automatic engine control equipment.

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A-99 Gas Carburizing Furnaces

Surface Combustion Corp. — The second number of the "Heat Treat Review" has just been printed. A feature of this eight-page issue is an article on gas carburizing furnaces, their design and operation, giving actual data as gathered in the field.

A-100 Cleaning Solvents

Oakite Products, Inc.—How solvent detergents provide benefits in hundreds of industrial cleaning applications is discussed in a 24-page illustrated booklet recently issued.

A-101 Condenser Tubes

Revere Copper and Brass, Inc.—Under the title of "Life Extension for Condenser Tubes," the firm has just issued an extensively illustrated brochure which reports on long research done on causes of corrosion

and means of combating them, as well as on the choice of condenser tube materials.

A-102 Strain Measurement

Baldwin - Lima - Hamilton Corp. — Bulletin 331, two-pages, describes the H-42A Strainalyzer. The instrument, used in conjunction with Baldwin SR-4 resistance wire strain gages, is designed for dynamic strain and vibration studies from 0 to 50,000 cycles per second.

A-103 Materials Handling Equipment

Clark Equipment Co.—In the current issue of its magazine "Material Handling News," the company makes a report to industry on its mechanized materials handling equipment.

A-104 Hydraulic Presses

The Hydraulic Press Mfg. Co.—The latest hydraulic press for the metalworking and allied fields have been recently introduced in a new catalog just released.

A-105 J.I.C. Hydraulic Standards

Miller Motor Co. — Revised to incorporate all changes and additions made at the most recent meeting of the Joint Industry Conference on hydraulics, a new edition of the Standards is now being offered.

A-106 Oil

The Texas Co.—Volume 37, No. 3, of the firm's monthly publication, "Lubrication," contains a 16-page article on engine oil pressure. Many illustrations are utilized to supplement the text.

A-107 Mobile Radio Equipment

Leece-Neville Co.—In the public interest, the company has published "A Guide to Mobile Communications for Civil Defense" which gives information on equipment for two-way mobile radio.

(Turn to page 114, please)



THIS TIME SAVER COUPON is for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

Readers' Service Department,
Automotive Industries,
Chestnut & 56th Sts., Philadelphia 39, Pa.

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NEW NEW



FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 56

B-54—Low Cost Contour Projector

An inexpensive projector designed to introduce optical gaging methods into production assembly and inspection is

unveiled by the Eastman Kodak Co., Rochester, N. Y. By projecting a greatly enlarged shadow or a surface reflection of any object placed in its staging field onto a large illuminated screen, this Kodak contour projector Model 3 permits instant visual checking of the

Engineered by Borg & Beck...

... means
MAXIMUM
PERFORMANCE
MINIMUM
MAINTENANCE!



You can depend on

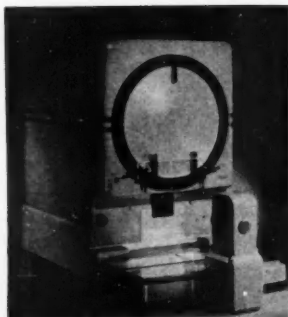
BORG & BECK

CLUTCHES...FOR THAT VITAL SPOT WHERE
POWER TAKES HOLD OF THE LOAD!



Reg. U.S. Pat. Off.

BORG & BECK DIVISION • BORG-WARNER CORPORATION
Chicago 38, Illinois



Eastman Kodak contour projector, Model 3.

actual part against detailed drawings or other specification data previously placed over the viewing screen. The unit is specifically for use "on the line" in contrast to usual use almost exclusively in the tool room.

Reduced over-all size of the unit, and its particular optical system allows full unvarying eight in. of space between lens and object for all magnifications up to 100x. This permits use of high-production staging fixtures that automatically key projected objects to a tolerance chart which may be accurately positioned over the projection screen.

The new model is a stripped down version of the contour projector introduced by Kodak last year. Projector body, work table, and lamp house can all be separated for attachment to large fixtures used in optical gaging of very large equipment.

The Model 3 has an accessory by which light can be sent out of the same lens that picks up the image so that surfaces and deep recesses which cannot be shadow projected may be examined. Either surface or shadow projection is possible for objects facing toward the lens, up, down, to the left, or to the right.

FOR PRECISION* THREADS

GET GROUND-THREAD-CHASER

NAMCO TAPS

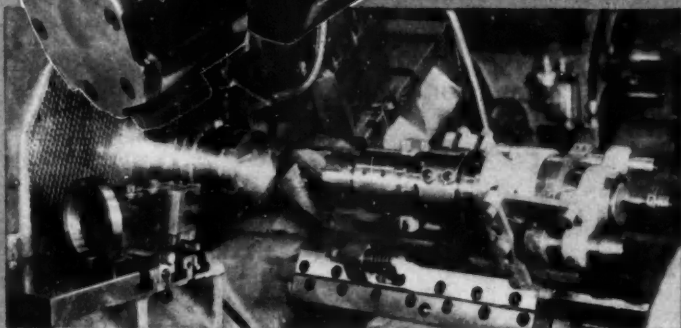


You'll get smooth threads every time with ground-thread-chasers—and ground threads are a feature employed on every Namco chaser, either circular or adjustable-blade type. Illustrated is a Namco RST Tap, equipped with six adjustable blade chasers.



CLASS 3 THREADS

on this $3\frac{1}{8}$ "-16 pitch tapped ring are produced by a Namco RST Collapsible Tap on a $5\frac{1}{4}$ " Acme-Gridley Model M Single Spindle Automatic.



Namco collapsible taps are famous for smooth, clean thread form, for fine fit and for uninterrupted precision tapping on long runs. That's the direct result of exclusive Namco design and construction features. Check these:

- ✓ **FEW PARTS**—Hardened and precision ground throughout, for less wear, easier replacement.
- ✓ **RIGID CONSTRUCTION**—Heavy core piece supports chaser full length; heavy body for side support.
- ✓ **QUICK, POSITIVE ACTION**—No lost motion, no drag because of trigger-like collapsing action at instant cut is finished.
- ✓ **FINE DIAMETRIC ADJUSTMENT**—is provided through simple adjustment of only one screw. Conversion for use on nonrevolving spindle machine merely by adding handle.
- ✓ **ECONOMICAL, LONG LIFE**—More regrinds per chaser, matched by minimum investment for heads: 8 tap sizes, from $1\frac{1}{8}$ " to 4" for adjustable blade chaser type; for circular chaser type, one body for 3" to 5".

For complete details on all Namco RST Collapsible Taps and Vers-O-Tool Self Opening Die Heads, ask for Catalog D-51.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics:
1-4-8 and 8 Spindle • Hydraulic Thread
Rolling Machines • Automatic Threading Dies
and Taps • The Chrono-Limit, Motor Starter
and Control Station Switches • Solenoids
Centrifuges • Contract Manufacturing



NEW



• PRODUCTION • EQUIPMENT • PLANT •

(Continued from page 58)

B-55—New Model Drop Hammer

Chambersburg Engineering Co., Chambersburg, Pa., is putting out a

new model Ceco-Drop especially suited to the production of cutlery, hollow ware, jewelry, silverware, etc. Model "C" Ceco-Drop is a piston-lift, gravity drop hammer, designed for the production of work requiring short snappy strokes, permitting faster, more accurate production.



Dole DV

Thermostats by truly modern performance from new design, will help sell your cars—make buyers boosters

Accurate, powerful thermal element.

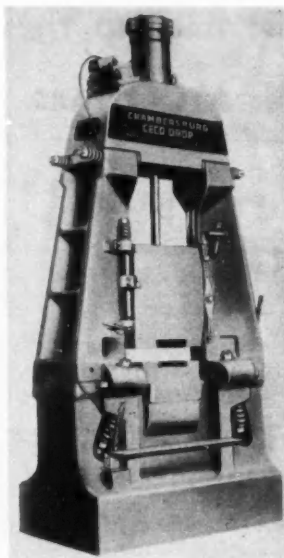
Operates positively against high pump pressure of sealed cooling systems. Efficient with atmospheric systems.

Full seating pressure aids quick warm-up.

CONTROL WITH DOLE

THE DOLE VALVE COMPANY
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Philadelphia • Detroit • Los Angeles

For additional information please use coupon on page 56



Chambersburg Model "C" Ceco-Drop.

Work of this nature often makes it necessary to wipe or polish the top die after a certain number of strokes. To provide for this, the Model "C" Ceco-Drop has a safety rest attached to the left-hand frame, easily swung into place under the ram when elevated.

The ram is lifted by a piston operating in a cylinder and falls by gravity. The piston rod is held by a special clamp when not operating. When the operator steps on the treadle, an air valve releases the clamp and the rod rides freely up or down. "V" type solid frames give extra strength and greater working space. Guides are integral with frames and are electronically hardened for long wear. Guides, cylinder and valves are lubricated automatically by a motor-driven lubricator. Fabreka pads are used between frames and yoke to cushion vital mechanisms. A safety cylinder cover keeps a cushion of live air constantly above the piston for protection. The piston rod is of heat treated alloy steel and is seated in the ram with a bronze bushing.

The stroke is controlled by quick positioning dogs mounted on a pivoted rocker which is in turn connected to the operating valve. A shock absorber connected to the rocker neutralizes shock and vibration. Where it is desired to change from long stroke to short stroke or vice-versa, the Ceco-Drop Short Stroke Control may be attached. This is a special air-operated

EXCLUSIVE

FLUID DRIVE
reduces
clutch wear

**AUTOMOTIVE TYPE
SAFETY BRAKES**
smooth brake action

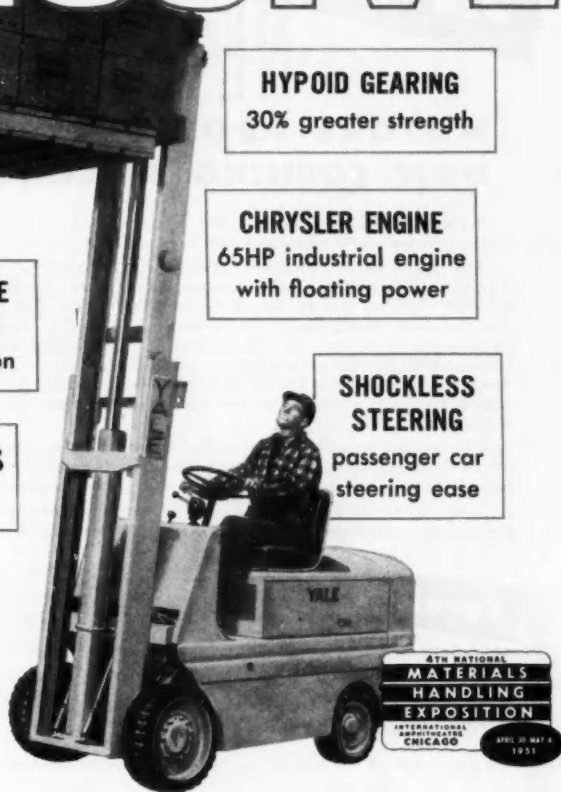
ROLLER CARRIER UPRIGHTS
low friction—long life

HYPOID GEARING
30% greater strength

CHRYSLER ENGINE
65HP industrial engine
with floating power

**SHOCKLESS
STEERING**
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Only **YALE**
combines all these
modern engineering
achievements in one
superior gas truck!



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after 2 years of intensive on-the-job testing**

JUST LOOK at the engineering and technical improvements built into this new YALE Fork Lift Gas Truck!

Here are exclusive features that will bring more time-saving, man-saving, money-saving advantages to your materials handling than was ever before possible!

In every vital part of this truck you get the finest new developments in automotive engineering—every part built for years of hard service—every part tested and re-tested under rugged on-the-job conditions.

That's why today you get smooth, powerful gas truck operation day-in day-out. On steep ramps, rough roadways, in any weather—this YALE Gas Truck *delivers*, moves, lifts and stacks the goods. Let us show you exactly *how* YALE can accomplish all of this in your plant. Write for the facts today.

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AUTOMOTIVE INDUSTRIES, April 15, 1951

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NEW CLASS H * MOTORS PROTECTED BY DOW CORNING SILICONES

... the insulation that has already saved industry millions of maintenance dollars plus the hourly output of hundreds of thousands of men!

This most timely announcement caps the test program we started 8 years ago when silicone resins were introduced by Dow Corning Corporation. First we proved by accelerated life testing that silicone insulated motors had a good 10 to 1 advantage in life expectancy and wet insulation resistance. Then we sold silicone (Class H) insulation to the manufacturers of electrical equipment ranging from lift truck and traction motors to solenoid and brake coils. We also encouraged the better rewind shops to rebuild hard working industrial motors with Class H insulation.

Now we can proudly refer American industry to this goodly list of electrical manufacturers, all able and willing to supply electric machines protected by Class H insulation made with Dow Corning Silicones.

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WESTINGHOUSE
ELECTRIC CORPORATION



*"Class H" insulation is the kind of insulation that keeps motors running in spite of "Hell and High water." (language dictionary)

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NEW PRODUCTION AND PLANT EQUIPMENT

For additional information please
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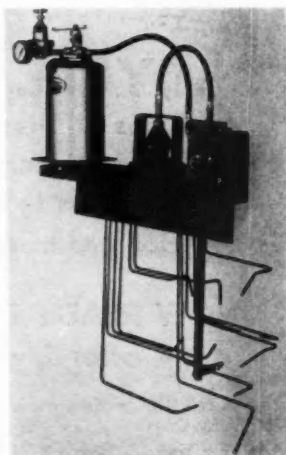
dog controlled by a push-button on the treadle. Pressure on the button changes the kind of stroke. Release of the button reverts to the standard stroke.

Frame-to-anvil bolts are recessed avoiding hazards. Ram is shorter front to back, giving greater access to dies.

The Model "C" Ceco-Drop has a 20 to 1 anvil; that is, the anvil is twenty times the weight of the ram. It may also be made 15 to 1 where specified.

B-56—Automatic Conveyor Lubricator

This automatic 12-point lubricator especially designed for automobile body conveyors by the J. N. Fauver Co., Inc., Detroit, Mich., is installed on one of the latest power and free type of con-



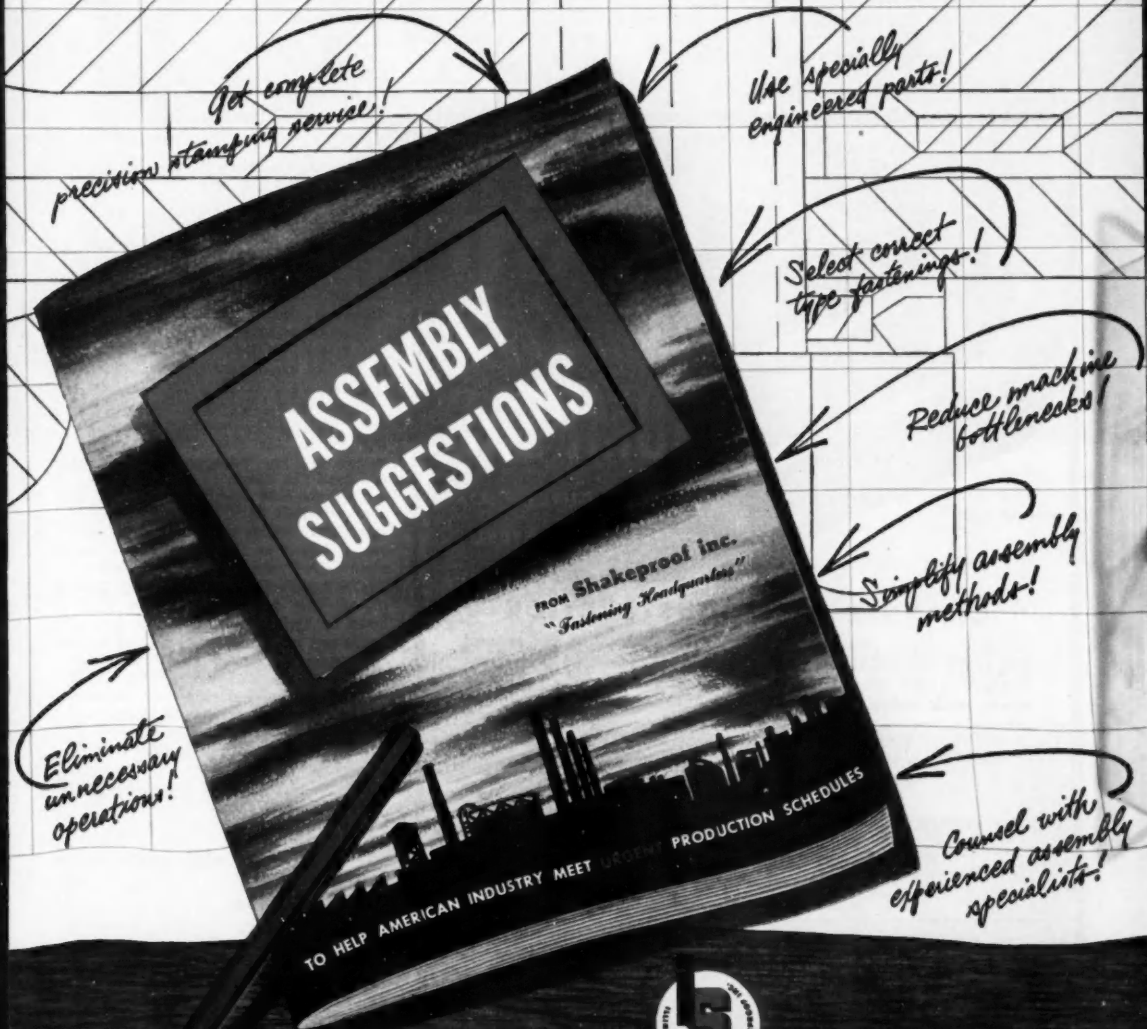
Fauver automatic 12-point lubricator.

veyors that passes through wash and paint booths in a new plant of one of the biggest of the automobile body builders. All of the critical points of wear are reached with this controlled lubrication that were formerly lubricated by hand. The two gallon reservoir, sufficient for a two weeks' supply, is equipped with air regulator and pressure gages, as well as the necessary manifolds, flexible connections and nozzles required for delivering oil to the vital points.

(Turn to page 64, please)

AUTOMOTIVE INDUSTRIES, April 15, 1951

New Book Tells How to SPEED URGENT PRODUCTION!



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• PRODUCTION • EQUIPMENT • PLANT •

NEW EQUIPMENT NEW



(Continued from page 62)

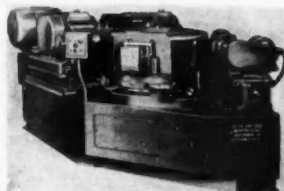
B-57—Milling and Center Drilling Machines

Designed and built by the Motch & Merryweather Machinery Co., Cleveland, Ohio, are high production mill-

ing and center drilling machines which will machine a range of forgings or shafts from 4 in. to 16 in. length, at a production rate of 220-240 pieces per hr, with simultaneous operations of milling and center drilling both ends, while the operator is unloading and loading.

For additional information please use coupon on page 56

The machine consists of a 48 in. table holding three clamping fixtures, opposed heavy duty Motch & Merryweather M-30 milling heads, and opposed single speed center drilling units mounted on heavy welded base.



Motch & Merryweather milling and center drilling machine.

FULL-FORM

WRAP-AROUND

REGULAR FORM



NASH BROS. Body-Gard BUMPERS

CUSTOM-BUILT FROM
HI-TENSILE STEEL

CHANNEL TYPE CONSTRUCTION

Flexible tooling and equipment assure economical prices and PROMPT DELIVERY on small or large quantities of Body-Gard Bumpers. They are available for the front and rear of all types of trucks, truck bodies, buses, coaches and all other commercial vehicles.

Send for further information explaining how easy it is to order custom-built bumpers to your exact specifications.

5 FACE WIDTHS:

3½", 4½", 5½", 6" and 6¾" wide

3 STYLES:

REGULAR—With 3½" end form

FULL—With end form up to 7½"

WRAP AROUND—End form as deep as required



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Slant Basket Carrier

NASH TIRE CARRIERS

Cable Lift Carriers available in Under Frame, Side Mount and Frameless Types. Slant Basket Carriers, universal for any rim or any make of steel wheel.

For replacement or original equipment write for folder.

NASH BROS. COMPANY
2125 DEWEY AVENUE, EVANSTON, ILLINOIS

The machine cycle is semi-automatic. The operator loads the work and depresses a lever causing the vise jaws to close, clamping the stock. The cycle button is then pressed causing the index table to rotate 120 deg. The opposed milling heads rapid advance, feed, and rapid return. The table is then indexed 120 deg to the center drilling station for double end operation. During the index to the unloading station, the vise is automatically opened to allow the operator to unload and load the stock.

This machine features the Motch & Merryweather M-30 single speed milling heads capable of face milling alloy steel pinions at 24 in. to 30 in. per minute feed rate, and the new hydraulically actuated mechanical index table giving fast mechanical motion cushioned by hydraulic action. The milling heads can utilize up to 30 hp and have two inches of quill adjustment for cutter setting and wear. The index table is relieved during the rotation and clamped solidly at each machining station.

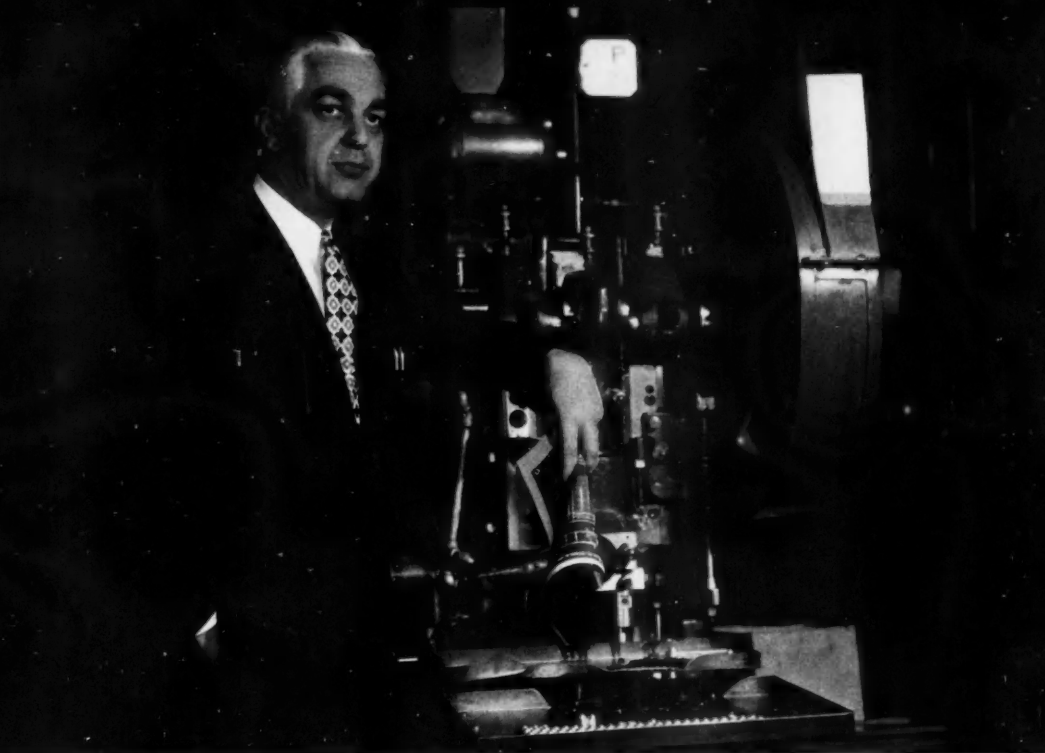
The hydraulic pump is driven by a 7½ hp, 1200 rpm motor. Lubrication of all moving parts is automatic.

B-58—Vertical Milling Attachment

A vertical milling attachment, announced by the W. H. Nichols Co., Waltham, Mass., quickly converts standard horizontal Nichols millers for precise diversified vertical milling operations, and is designed to take full 1 hp drive, with maximum speeds up to 2000 rpm.

The vertical attachment consists of a heavy one piece casting which houses the entire mechanism. Accurately machined alignment pads on the body casting allow for easy mounting in a true vertical plane. The hardened and ground drive shaft is mounted in pre-

(Turn to page 69, please)

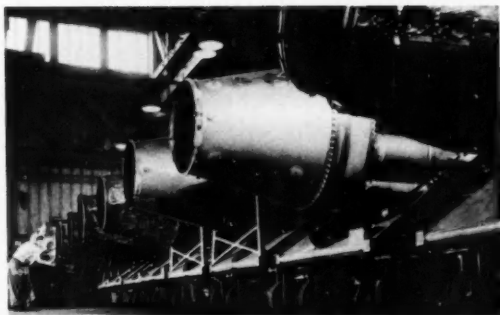


FRED A. HOFMANN, production vice president of the Elastic Stop Nut Corporation of America, says, "We're back on a full 2-shift production schedule, and practically every one of the 62 Tri-Clad motors we've installed since 1941 in our plant at Union,

N. J., is going night and day. Sure, we make a lot of steel products, but for a general-purpose motor, we don't think you can beat cast iron. After the pounding we've given our Tri-Clad motors for the past 10 years, we're stronger than ever for Tri-Clads."

ELASTIC STOP NUT CORPORATION:

"We're stronger than ever for Tri-Clad triple protection!"

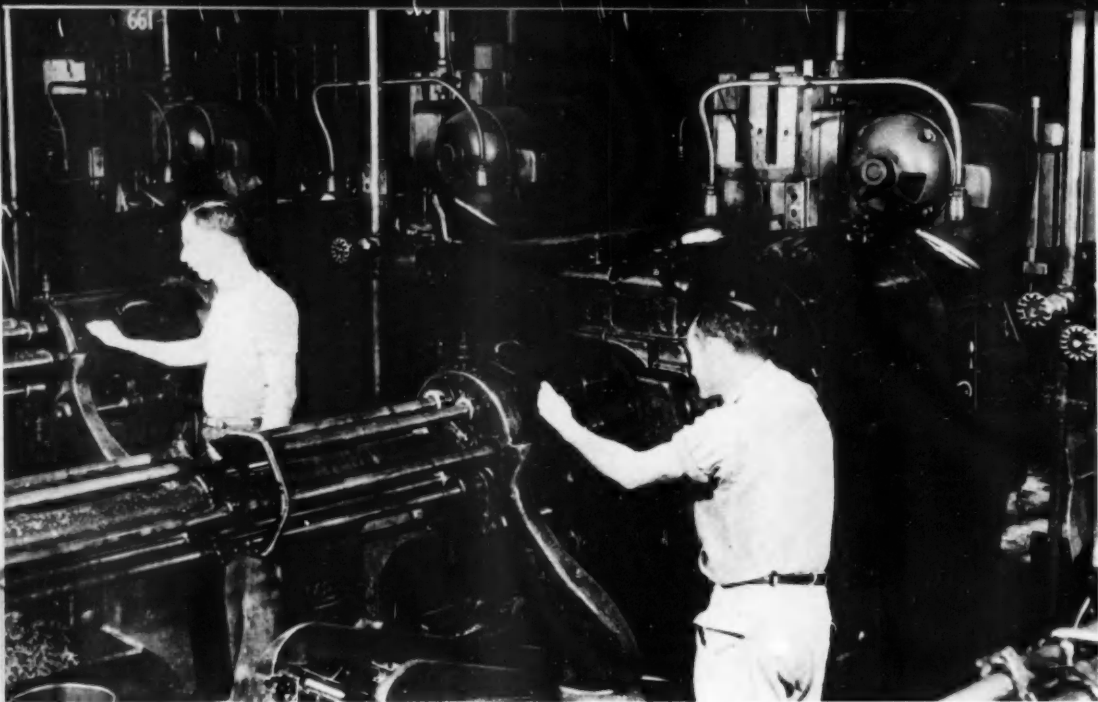


TRI-CLAD MOTORS drive machines that produce ESNA fasteners for use on jet aircraft engines—the engines that power our modern military planes. Each of the jet engines above uses a large number of these special stainless-steel high-temperature nuts, designed to hold under the extreme heat and other severe conditions of jet-engine operation. Moreover, these nuts must be re-usable without seizing or galling the finish. ESNA counts on the reliability of their Tri-Clads to help turn out thousands of these fasteners every day.



VIRILE VETERAN. This 10-hp Tri-Clad motor has been driving an Acme Gridley multiple spindle bar machine for nearly 10 years. It's still going strong, another reason why, after 10 years, ESNA thinks Tri-Clad is still their best motor buy! And today's Tri-Clad motor, all-industry favorite, is better than ever! ➡

GENERAL  ELECTRIC



4 STEPS—AND NO HANDS! Backbone of the ESNA production line, the Acme Gridley automatic bar machine (3 shown above) ejects a finished nut blank every $4\frac{1}{2}$ seconds. The operator simply keeps the six spindles supplied with bar stock. The machine feeds stock, machines the nut profile, drills 2 holes and cuts off to ac-

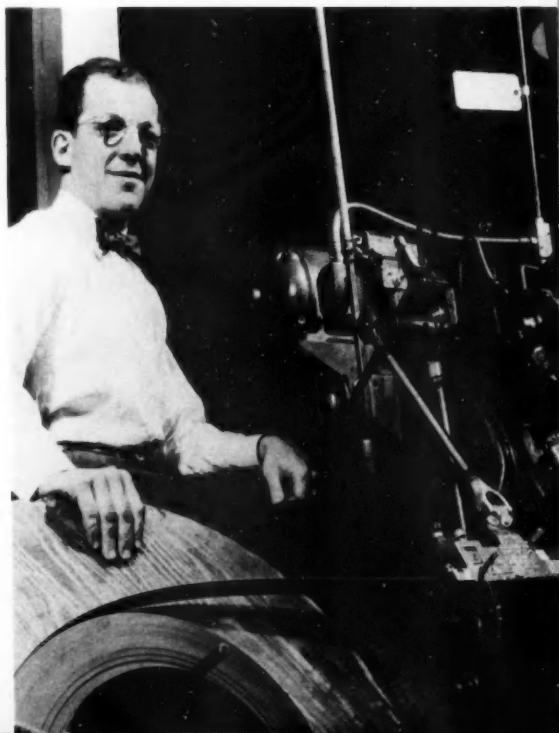
curate lengths. The load on the 10-hp drive motor is heavy and constant—but Tri-Clad, with its bearings completely enclosed in cast-iron housings, can take it! Maintenance department can't recall a single Tri-Clad bearing ever having to be replaced. Moreover, if they need it, the motors are easily greased while running.



TRI-CLAD MOTORS
REG. U. S. PAT. OFF.

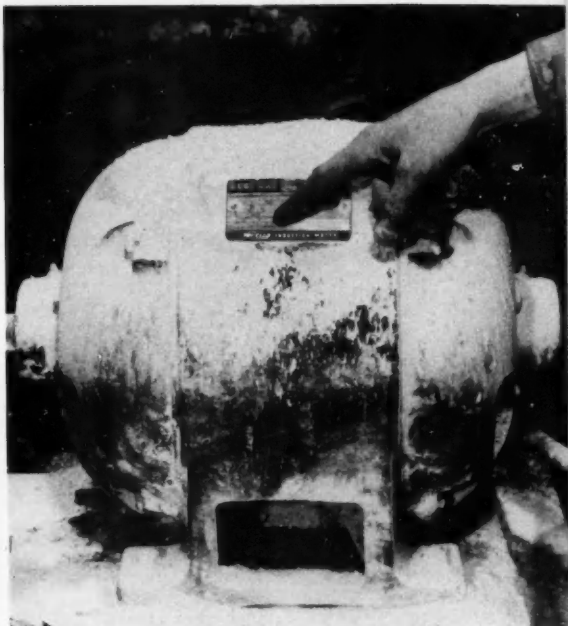
**Help Keep ESNA
Production Up!**

PRODUCTION PUSHER General plant foreman Karl Kjellburg has the job of meeting "impossible" defense program manufacturing schedules. He's counting heavily on automatically fed machines like the Tri-Clad driven V. & O. press on his left; says, "This press inserts over 200 elastic fibre locking collars a minute in a $\frac{3}{8}$ " fastener. Driving it is a big job for a motor. Our Tri-Clads gave us no trouble during the war. We're counting on them again!"





TROUBLE SHOOTER TESTIFIES Ed Conk, ESNA's maintenance chief, must furnish reliable power wherever it's needed in the plant. He's got some definite ideas about electric motors; says, "We like a motor you can regrease easily if you have to. So far, we've had to regrease very few of our Tri-Clad motors. And those were either on hot spots or on particularly tough jobs. The point is—we could readily have regreased them all if it was necessary."



TOUGHEST... on the inside Extra protection against electrical breakdown is built into every Tri-Clad motor. Formex® wire windings, one-piece cast-aluminum rotor, double-end ventilation—these are features that prolong a general purpose motor's useful life.

TOUGHEST... on the outside Teeth rattling blows, dripping liquids, corrosive fumes—they're all in a day's work for Tri-Clad cast-iron construction. You get a rigid structure, too—one that won't twist out of line when you're bolting it down.

TOUGHEST... at the bearings A Tri-Clad motor will run safely without relubrication for as long as any general purpose motor you can buy. But, if the application does make relubrication a "must", you can grease your Tri-Clad without halting production.

* Reg. U.S. Pat. Off.

How to Keep Your Motors in Shape for the Job Ahead!



TIMELY READING With every electric motor needed on the line, once again it's time to be a crank about motor care. That's why every motor user needs this General Electric manual. Tells how to spot motor and generator trouble before it happens, how to prevent serious breakdown, how to conduct a regular motor maintenance program. Order a copy for your maintenance department today! Use the coupon!

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Schenectady 5, New York

Please send me my free copy of "How To Maintain Motors and Generators" (GET-1202)

Name

Company

Address

City State

GENERAL  ELECTRIC

You'll find some worthwhile information on
motor control on the next page ➡

"...NO SHUTDOWNS DUE TO STARTER FAILURE!"

**Here's a tip on real motor-starter
dependability from a
leather-processing plant executive**

As chief engineer of a leather-processing plant, it's Mr. Arthur B. Sullivan's job to keep electrical equipment throughout the plant running smoothly. So it's a safe bet he knows what he's talking about when it comes to motor-starter dependability.

Says Mr. Sullivan: "When a motor drive won't start because its motor starter fails, we're tied up until it's fixed. We lose output and, if it's a continuous processing line our rejects may be high.

"Because of this, we've had to compare starter against starter. We haven't found one that beats this G-E starter. Since installing it, we've had practically no shutdowns due to faulty starting. What's more, this G-E starter is easier to install and service. We're sold on it!"

MAKE SURE YOUR PLANT ELECTRICIAN KNOWS ABOUT THESE G-E STARTER FEATURES:

For Longer Life

Fine silver contacts, "Strongbox" Magnet Coil, "molded-in" coil lubricant.

For Easier Maintenance

A screwdriver is the only tool needed for servicing. All terminals are "up front".

For Greater Flexibility

Contacts that are easily changed from normally open to normally closed.

For details on the full line of G-E magnetic motor starters, write for Bulletin GEA-5153. Manual starters for infrequent starting operations are described in Bulletin GEA-1522. For pricing and shipping data, phone or write your G-E representative or authorized G-E distributor. Section A730-21, Apparatus Dept., General Electric Company, Schenectady 5, N. Y.



Herman F. Zoll, Purchasing Agent and Arthur B. Sullivan, Chief Engineer of John R. Evans & Co. inspect the G-E motor starter that is giving motors throughout their plant the reliable control and protection needed to keep output up, rejects down.



Martin Kelly, Evans Co. Plant Electrician, removes arc head on G-E motor starter that isolates and protects each contact in its own chamber.

GENERAL  **ELECTRIC**

730-21



NEW EQUIPMENT PLANT



For additional information please
use coupon on page 56

(Continued from page 64)

cision double row ball bearings, and the vertical spindle in Zero precision Timken bearings at both ends. Spiral bevel drive gears are heat treated and fitted to assure smooth quiet operation.

The spindle of the vertical attachment is hardened and ground with maximum allowable runout held within 0.00015 in. full indicator reading. The vertical spindle nose is identical with



Nichols vertical attachment for standard horizontal millers, shown in set-up on a profiling job.

the horizontal spindle nose, bored No. 40 National Standard Taper, and thus will interchange all tooling. A standard drawbolt is furnished. A draw-in collet attachment is available.

The vertical attachment is mounted in a circular tee-slotted adapter plate, which encompasses the horizontal spindle nose, and is held by four bolts. It may be swiveled around the horizontal spindle. Graduations in degrees are provided. The attachment is driven through a splined adapter in the mouth of the horizontal spindle. Spindle speeds of the vertical attachment are one-third higher (4.3 ratio) than available horizontal spindle speeds. Vertical spindle speeds exceeding 2000 rpm are not recommended.

B-59—Band Saw Angle Guide Blocks

Extensively greater sawing capacity is afforded on DoAll band saw machines by use of the new 30 deg angle saw guide blocks available from DoAll Co., Des Plaines, Ill. These angle saw guides adapt all DoAll models to cut-off work of any length by merely twisting the saw band to increase the material ca-

capacity of the sawing machines for the gross cutting of material that is longer than the normal throat capacity of the sawing machine.

For example, a 36 in. throat machine

Band saw, equipped with DoAll 30 deg angle saw guide blocks.



VULCAN

RUBBER COATED FABRIC

Is the Perfect Diaphragm Material for COMBINATION FUEL AND VACUUM PUMPS

More and more manufacturers are now making these combination units, and more and more are using VULCAN diaphragm material.

When you specify Vulcan Coated Fabrics for fuel pumps and vacuum booster pumps, you get material that is TWO WAYS right in meeting your requirements.

The same material that has such excellent resistance to aromatic gasoline also provides the high tensile and burst strength necessary to operate the vacuum booster pump.

Wherever diaphragms are used in automotive parts, VULCAN offers the right kind of diaphragm fabric for the job. Write for literature.



VULCAN

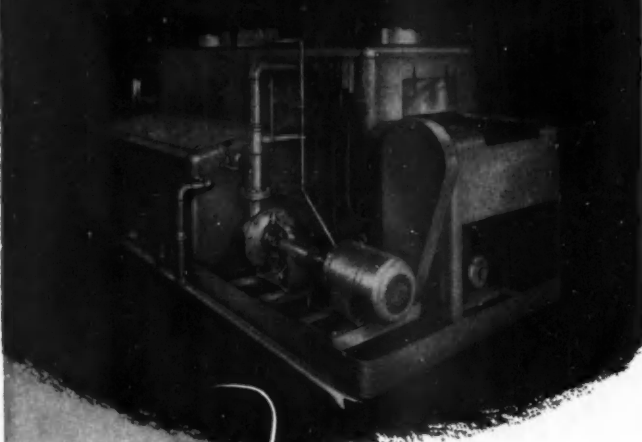
RUBBER PRODUCTS, INC.

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Although small, this Cincinnati Cleaning Machine does a big job for this well known automotive and aviation accessory manufacturer. Baskets of widely varying stampings and die castings travel through the machine for cleaning prior to inspection. Many of the parts are easily damaged, have hollows or recesses, yet they are cleaned faster, better and at a saving of 25% over methods previously used.

Comparable savings have been effected by Cincinnati on metal-cleaning installations throughout industry. Let Cincinnati Cleaning engineers show you how it can be done in your own plant.

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Cincinnati

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NEW PRODUCTION AND PLANT EQUIPMENT

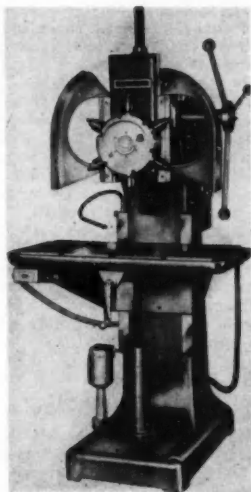
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use coupon on page 56

with standard guides can cut off a piece of stock only 36 in. long. However, with 30 deg angle guides there is no limit to the length of extrusions or bar stock that can be handled, the company points out.

For DoAll Utility models and the standard Contour machines with tool speeds of 50 to 1500 fpm, there are 30 deg angle insert type guide blocks. For the Zephyr high speed bandsaws there are 30 deg insert type, and also 45 deg angle roller type available. For the DoAll Contour-matic, the hydraulically operated machine for all types of band machining with speed ranging from 40 to 10,000 fpm, there are three types of angle guides: 30 deg insert type; for blades up to 1/2 in. width, 35 deg roller type for high speed operation with blades up to 1 in. wide, and 45 deg insert type for use with 3/4 in., 1 in. or 1 in. wide blades at conventional metal sawing speeds.

B-60—Drilling and Tapping Machine

A model six-spindle automatic indexing, drilling and tapping machine developed by the Burg Tool Mfg. Co., Los Angeles, Calif., to eliminate waste motion in production by making movement



Burg six-spindle automatic indexing and tapping machine, Burgmaster No. 2 Model A.

STROMBERG

CARBURETORS

Lasting

**Performance in Today's Cars
Will be Tomorrow's
Strongest Selling Point!**

Today, more than ever, new car buyers are looking for features that assure long, satisfactory performance. Engine components that contribute to this accomplishment now assume even greater importance as they not only influence today's sales, but become tomorrow's strongest selling point.

For owner loyalty as well as immediate sales, it pays to specify Stromberg*—the carburetor built for *lasting performance*.

*REG. U. S. PAT. OFF.

ECLIPSE MACHINE DIVISION OF

- Standard Equipment Sales: Elmira, N. Y.
- Service Sales: South Bend, Ind.

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.





• PRODUCTION • EQUIPMENT • PLANT •

**NEW
EQUIPMENT**



of work piece from one machine to another obsolete, provides power index from one spindle to another with a wide range of spindle speeds, is pre-selective per each spindle, and pre-selective and automatically indexed. It has $\frac{1}{4}$ in. capacity in steel; heavy duty tapping head; 8 in. stroke; 17 in. by 33 in.

table work surface; $11\frac{1}{4}$ in. throat depth; spindles on tapered, adjustable roller bearings; and totally enclosed gearbox, running in oil.

The new No. 2 Model A Burgmaster is said to make the use of carbide tools for second operations on drill press work quite practical, since in many

For additional information please use coupon on page 56

cases several operations on a part can be completed without moving the part, thereby eliminating danger of tool breakage due to the jib being out of position with respect to the tool.

B-61—Pivot Polishing Machine

Hauser Machine Tool Corp., Manhasset, N. Y., is making available to U. S. industry another high-precision Swiss tool for burnishing, developed by Henri Hauser, Ltd., Bienne Switzerland, the Hauser Type 241.

The tool incorporates the latest advances in high precision, low-cost pivot polishing and is basic to the new Hauser burnishing method, which is reputed to be faster and more accurate than any other grinding or polishing method known, according to Hauser. Its range is as follows: Minimum diam to be polished, 0.008 in.; Maximum diam to be polished, 0.197 in.; Maximum length to be polished, 0.315 in.; Maximum length of workpiece, 5 in.

The Type 241 will replace in many instances centerless grinding and it can be operated by unskilled labor. Burnishing is done by special carbide or ceramic wheels having long-lasting life but requiring little redressing. It will polish pivots straight, taper or radius, polishing the shoulder at the same time as the cylinder at right angle or bevel. It will polish mild steel, hardened steel, stainless steel, brass, nickel, bronze, etc., at 600 or more pivots per hr.

Improved Product Performance

...one of 6 advantages of

Lamb Electric

SPECIAL APPLICATION
FRACTIONAL HORSEPOWER

MOTORS



Planetary inbuilt speed reducer permits a straight-line drive, symmetrical construction; insures good performance.



Helical geared fuel transfer pump motor having maximum output with minimum weight. For aircraft, but adaptable to other uses.

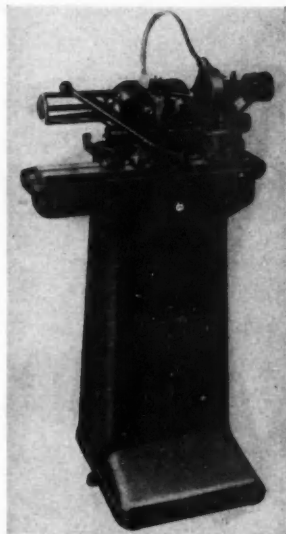
A motor engineered to the exact requirements of your product generally results in greatly improved product performance.

Lamb Electric Motors, built to precision standards of high quality materials, also make available: reduced product weight, increased dependability, compactness, improved appearance and lower cost. We shall welcome the opportunity to discuss these benefits in terms of your products. The Lamb Electric Company, Kent, Ohio.

Lamb Electric

SPECIAL APPLICATION
FRACTIONAL HORSEPOWER

MOTORS



Hauser Type 241 pivot polishing machine for wet polishing.

Lift a money-saving Idea
from
Mr. Mallory's best coil ...

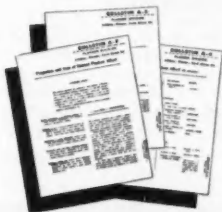


**You can make your electrical parts
better, faster, often at lower cost**

The coil top of this Mallory Electric Corporation ignition coil is molded from Plaskon Alkyd, the thermosetting molding compound with special superior electrical properties. This Plaskon Alkyd coil top, along with other top-quality materials, lets Mr. Mallory confidently label this "the best coil I ever made"... and sign it!

Other superior properties of Plaskon Alkyd include high resistance to "tracking" and arc-injury, low moisture absorption, resistance to organic solvents and detergents, and dimensional stability even at elevated temperatures and humidity.

Plaskon Alkyd molding compounds have saved up to 50% in parts cost... quick curing properties permit faster molding cycles, fewer mold cavities and lower molding pressures. Plaskon Alkyd is readily molded in fully automatic or modified conventional molding equipment.



*We will gladly send you literature and tell you
more about Plaskon Alkyd molding compounds*

mold it better and faster with

PLASKON DIVISION • Libbey • Owens • Ford Glass Company
Toledo 6, Ohio

*In Canada: Canadian Industries, Ltd., Montreal, P. Q.
Branch Offices: Boston, Chicago, Los Angeles, New York, Rochester
Manufacturers of Molding Compounds, Resin Glues, Coating Resins*

PLASKON.

ALKYD

NEW PRODUCTS

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 56

C-93—Push-On Type Speed Nut

For securing the oil baffle in an automobile engine a self-retaining push-on type Speed Nut in production by Tin-

nerman Products, Inc., Cleveland, Ohio, is the latest of more than 1500 types and sizes of Speed Nuts, Speed Clips,

"Tulite"—the first two-filament headlight lamp for city and country driving.

AND IT HAS THOSE NEW TUNG-SOL 'TULITE' LAMPS



Touring cars with high tonneaus and gleaming brass radiators were the latest in automotive styling when the TUNG-SOL "Tulite" was first introduced. Then, as now, TUNG-SOL Lamps were made under the strict manufacturing policy, "make the best that can be made."

Today, TUNG-SOL's "Quality Control" Department makes this policy a mathematical certainty, in the manufacture of an up-to-date line of automotive lamps. Entirely independent of manufacturing, Quality Control employs modern statistical methods to make certain that every all-glass sealed beam headlamp and every miniature lamp conforms to the light output specifications—the life standards—and the production requirements of the automotive industry.

TUNG-SOL LAMP WORKS INC., Newark 4, N. J., Sales Offices: Atlanta, Chicago, Dallas, Denver, Detroit, Los Angeles, Newark, Philadelphia.

Five plants devoted to the engineering and manufacturing of electron tubes, signal flashers, auto lamps—and nothing else.



TUNG-SOL

AUTO LAMPS



BRIGHTER LIGHT FOR BETTER SIGHT FOR SAFER DRIVING

NEW 1914 MODEL

Complete with
ELECTRIC
LIGHTS!



Tinnerman self-retaining push-on type Speed Nut.



and Speed Clamps manufactured by Tinnerman to lower the cost of automobile assembly.

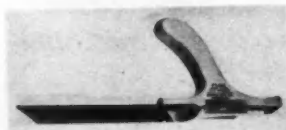
This special push-on incorporates two small spring arms that snap into holes in the baffle, making the fastener self-retaining. The baffle is then positioned on the engine block studs and pressed into place. The push-on engages the stud securely and permanently. To overcome wide tolerance variations on the cast studs, prongs on the push-on are specially notched to give it extra flexibility. Because of the self-retaining feature, it is also claimed ideal where space limitations make assembly difficult.

The fastener is made of heat-treated spring steel, 0.022 in. thick.

C-94—New Type File Holder

The Remont Mfg. Co. of Lombard, Ill., comes forward with this new type of file holder, called the Over-Tang, offering safety and control of a file in all its applications. The file holder provides a comfortable wooden grip, positioned for better control above the file when attached, so that the cutting sur-

(Turn to page 78, please)



Remont file holder, the Over-Tang.

**For Greater Endurance
and Longer Life**

**DUREX-100
ENGINE BEARINGS**



Know how Durex-100 bearings are built, and you know *why* they last longer in all kinds of service. Durex-100 bearings actually *absorb* particles of foreign matter . . . protect engine crankshafts to the limit.

In making Durex-100 bearings, the steel back is covered with a layer of metal powders that become a porous matrix integrally brazed to the steel back. A thin overlay of high-lead babbitt penetrates the matrix and bonds mechanically and metallurgically with it. Only Durex-100 bearings provide this protection that assures longer bearing life.

Durex-100 engine bearings are used as original equipment on Cadillac, Buick, Oldsmobile, GMC, and other leading makes of cars and trucks. Ask Moraine for the complete story on Durex-100 bearings. See how they can be used to advantage in the engines *you* manufacture.

STEEL BACK MATRIX BABBITT

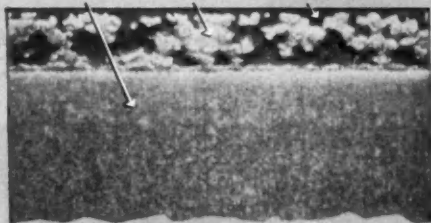


PHOTO-MICROGRAPH OF CROSS SECTION OF DUREX-100 BEARING, MAGNIFIED 31 TIMES

THE MATRIX MAKES THE DIFFERENCE

Steel-backed intermediate matrix of porous copper-nickel bonds mechanically and metallurgically with high-lead babbitt overlay to provide far greater embedability.

MORaine PRODUCTS
DIVISION OF **GENERAL MOTORS**
DAYTON, OHIO

*Durex-100
Engine Bearings
by Moraine*

SUNOCO ANNOUNCES..... AAA Certifies Engine Cleanliness,

ROAD TESTED UNDER AAA SUPERVISION



ROAD TESTED from Quebec to Key West and back... under the exacting supervision of the famous American Automobile Association... standard popular-make cars were not babied, not pampered. They were driven as you would

drive your own car. **AAA CERTIFIED RESULTS:** Long Mileage, Engine Cleanliness, Long Engine Life. Cars using NEW Sunoco Dynalube were driven over 2,000 miles, on the average, before a drop of oil had to be added.



SNOW, FREEZING WEATHER in Canada severely tested the free-flowing and metal-clinging qualities of NEW Sunoco Dynalube... proved how this NEW motor oil gives instant protection at all times—LENGTHENS ENGINE LIFE.



SUN, BROILING HEAT in Florida—test cars were driven at maximum speeds, up to 60 miles-per-hour wherever the law allowed—proved that the tough heat-resistant body of NEW Sunoco Dynalube ASSURES LONG MILEAGE.



DAVE GUNDRY, AAA OBSERVER. After road test AAA certified: Lab findings showed "a complete absence of injurious varnish or sludge"... proof that fully-detergent cleansing action of NEW Sunoco Dynalube **KEEPS ENGINES CLEAN.**

NEW DYNALUBE MOTOR OIL

Long Mileage, Long Engine Life

NEW Premium Heavy-Duty Motor Oil Combines in a Single Oil All the Finest Features of America's Premium Motor Oils... Actually Improves the Condition of Most Engines

ANY CAR...newest 1951 or earlier model...can now get *greater engine protection* with NEW Sunoco Dynalube, a new motor-conditioning motor oil.

Compare with any other motor oil these features listed on every can of NEW Dynalube:

1. **Tough Heat-Resistant Body** assures long motor oil mileage.
2. **Fully Detergent-Dispersant**—NEW Sunoco Dynalube cleans engines and keeps them clean. Road dust and contamination from normal combustion are held in harmless suspension until oil is drained at the regular interval.
3. **Free-Flowing and Metal-Clinging** qualities of NEW Sunoco Dynalube prolong engine life.
4. **Anti-Rust and Anti-Acid**—NEW Sunoco Dynalube

counteracts two of the greatest causes of wear in the vital combustion chamber areas of any engine.

5. **High Film Strength and Ring-Sealing Action**—insure longer-lasting engine efficiency.

NEW Sunoco Dynalube is one of the very few oils that meets or exceeds manufacturers' recommendations for all 1951 passenger cars.

Memo to GAS DEALERS

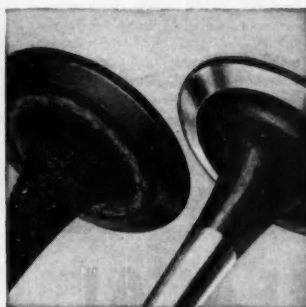
In gallons per pump, Sunoco gasoline sales nearly double the national average for the industry!... and now with NEW Sunoco Dynalube Motor Oil, even greater sales

records can be established in 1951! There may be a Sunoco dealership available in your area. Write for facts. Sun Oil Company, 1608 Walnut Street, Philadelphia 3, Pa.

**ON SALE ONLY AT SUNOCO STATIONS
AND SELECTED CAR DEALERS**



NEW SUNOCO DYNALUBE protected the clean piston on right. Fouled piston with stuck rings, at left, resulted from use of inferior motor oils. Dynalube's high film strength and ring-sealing action **RETAIN FULL ENGINE POWER.**



CLEAN VALVE on right protected by NEW Sunoco Dynalube, compared with corroded valve from engine using ordinary oil, shows how Dynalube fights acid and rust... **PREVENTS COSTLY ENGINE REPAIRS.**



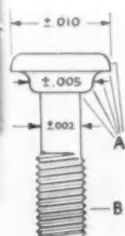
COLD HEADING

*Conserves Materials
Increases Production
Lowers Cost
Adds Strength*

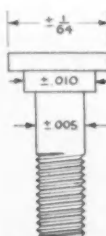
VITALLY IMPORTANT IN CRITICAL TIMES



LOW COST COLD HEADING



HIGH COST MACHINING



A cold headed fastener is made from wire, usually the same in diameter as the shank, and headed up to the large portions. The thread (B in diagram) is rolled up from the shank diameter wire to the same outside diameter as a cut thread. Scrap loss is negligible — a vital consideration when national emergency requires the utmost utilization of valuable material.

In contrast, a machined fastener must be made from bar stock equal in size to the largest part of the blank. Material cut away by machining down to the required shape and dimensions represents considerable scrap loss.

Knife-sharp corners and undercuts require second operation machining at increased cost — whereas generous radii and fillets (A in diagram) decrease cost and add strength.

Before your designs reach the blueprint stage, investigate HOLTITE'S Cold Heading Process. It offers a wide range of possibilities in the fabrication of fasteners and machine parts at a substantial saving in cost and metal, plus greater strength, close tolerances, flawless quality and high speed production. Send for free folder "Cold Heading Hints".

CONTINENTAL

SCREW CO.

New Bedford, Mass., U.S.A.



NEW PRODUCTS

For additional information please use coupon on page 56

(Continued from page 74)

face of the file will be unobstructed throughout its entire length including the tang. Unlimited comparatively flat surfaces can be filed.

Handle is made of wood to absorb moisture, and avoid its becoming slippery, and also because wood does not absorb and retain extreme heat or extreme cold. The handle is reinforced with a steel shaft to prevent breakage.

The file is attached to the handle by a steel V-block set in the handle itself, designed so that the file is driven on, and held so securely that it must be knocked off. The tang is covered by the handle for safety.

C-95—Air-Drying Plastic Coating

Development of a new air-drying plastic coating for protecting tanks, tank cars, pipes, fittings, structural steel parts and chemical processing equipment against attack by splash, drip and spray from corrosive chemicals, corrosive atmospheres, weathering and rust, is announced by United States Rubber Co., New York, N. Y.

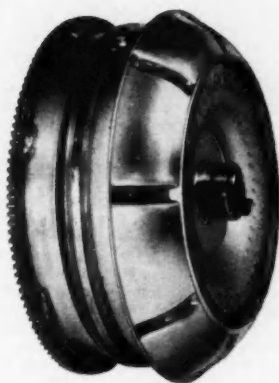
The coating is expected to find its broadest use in chemical processing, rayon and cellophane production, photo finishing, pulp and paper manufacturing, filtering and electroplating and in mining operations.

The plastic combines high film flexibility with good adhesion and impact resistance. It will not chip or crack and can be used on steel, aluminum, concrete, hardwood, or composition board. It is applied by spray, allowing one hr drying time between coats and 24 hrs drying time after the final coat. It requires no primer and can be produced in a variety of colors. Since it contains no chemical plasticizer to leech out or harden, it retains its flexibility throughout its service life.

A sharp instrument will cut through the film but the break can be repaired easily by "touching up" with brush or spray. Metal should be grit or sand-blasted before the coating is applied, cement should be etched with hydrochloric acid, while wood and composition board needs rough sanding to assure a good bond.

The new coating is in pilot plant production at the company's Providence, R. I., plant. It will be marketed by the mechanical goods division under the trade name U. S. Royalguard protective coating.

(Turn to page 80, please)

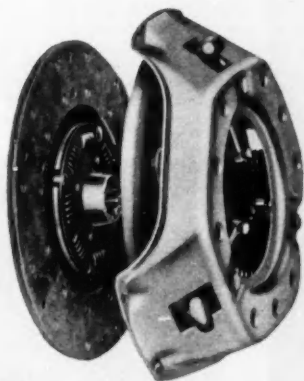
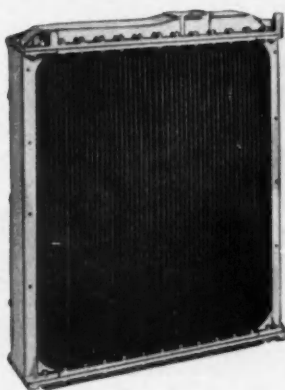


LONG TORQUE CONVERTER

Here's velvet-smooth power transfer, with torque multiplication of better than 2 to 1 at stall. Air-cooled for trouble-free service. Assembly units fabricated almost entirely from stampings for low-cost production.

LONG RADIATORS

Long radiators and maximum heat exchange have been synonymous throughout the automotive world since 1903. Fin-and-tube design and construction provide clean, unobstructed water courses. Capacities range from passenger car models to heaviest-duty commercial vehicle types.



LONG CLUTCHES

Effortless operation, dependable performance in stop-and-go traffic driving. At highway speeds, semi-centrifugal design gives increased torque capacity . . . less slippage, less wear. Long clutches have equipped millions of cars, trucks, buses and tractors since 1922.



LONG MANUFACTURING DIVISION
BORG-WARNER CORPORATION
DETROIT 12 and WINDSOR, ONTARIO

LONG

TORQUE CONVERTERS • CLUTCHES • RADIATORS • OIL COOLERS

NEW PRODUCTS

(Continued from page 78)

C-96—Protractor For Power Sawing

For use as a guide in power sawing a new saw protractor, introduced by the Black & Decker Mfg. Co., Towson,

Md., enables the operator to cut practically any angle.

Constructed of metal for rigidity, yet very light, weighing 1½ lbs, the saw protractor consists of a straight edge, a segment clearly calibrated in units of 1 deg, and an easily movable holding arm. The desired angle is set by loos-

For additional information please use coupon on page 56

ening a wing nut on the under side of the holding arm and moving the arm until the indicator points to the correct degree mark. The wing nut is then retightened to prevent slippage of the holding arm.

In operation, the side of the shoe of the power saw is lined up with the protractor's straight edge and the saw is advanced along this edge for quick accurate cuts. On many power saws either side of the shoe can be used depending on the cut desired.

The saw protractor is particularly useful for compound mitre cuts when used in conjunction with the bevel adjustment on most power saws. It can also be used for laying out any carpentry work involving angles. Its use is adaptable to practically all portable electric saws.

C-97—Staggered Tooth Double-Cut Files

Extension of the staggered tooth principle, a feature of Disston's Bite-Rite brand of files for many years, to its entire line of double-cut files, and improvements in the design of its taper files, are announced by Henry Disston & Sons, Inc., Phila., Pa.

Introduction of the original staggered tooth Bite-Rite file enabled files to be operated on the principle of cutting rather than scraping. Overlapping teeth meant a smoother cut; undercut teeth resulted in faster removal of chips; and the open gullets gave longer life to the files, the company explains.

The staggered tooth principle is now incorporated in the double-cut files of the Gold Medal, Disston, and Fast-Cut, as well as the original Bite-Rite line.

Meanwhile, single-cut files will continue to be produced as before. Single-cut taper files have been improved and strengthened on the edge by a change in design to assure longer life.

Do any filing job
easier,
better
and faster
with

OVER-TANG File Holder

The newest method for all filing operations gives better control without handle interference. The Over-Tang positions the file to give accurate operator control, and the precision V-block grips the tang accurately and securely. You drive it on—knock it off. Vertical wooden handle is steel reinforced—you use it like a carpenter's plane. Ruggedly made for efficient, long, hard use. Weighs about six ounces.

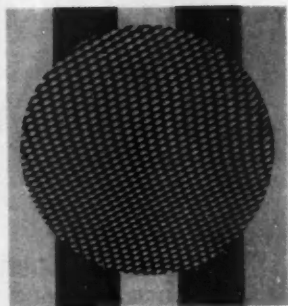
Three sizes:

- No. 14H—for 14" heavy files
- No. 12M—for 12" heavy files
- No. 12L—for 12" and 14" Mill files



For full details and prices,
write or phone to

Remont
MANUFACTURING COMPANY
1301 Meyers Road, Lombard, Ill. • Tel: Lombard 2373



Enlarged section shows "staggered tooth" principle of file construction, which has now been applied by Henry Disston & Sons, Inc., to its entire line of double-cut files.

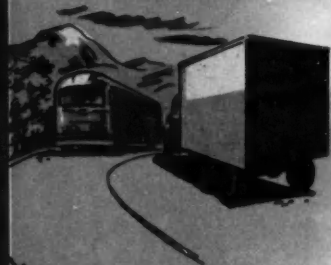
(Turn to page 84, please)

Know How

**KELSEY-HAYES, known for
Know-How in products for
peacetime and defense
production.**

Kelsey

Hayes

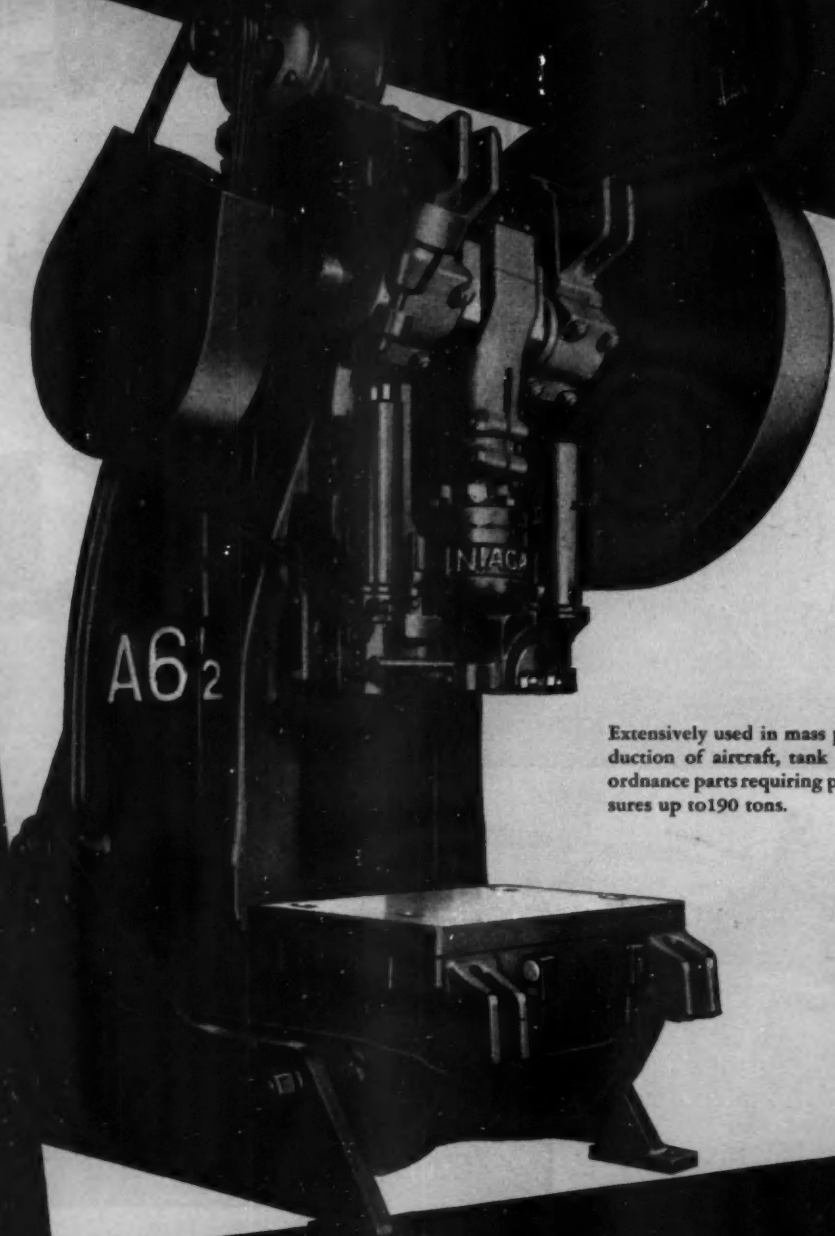


8 KELSEY-HAYES WHEEL COMPANY PLANTS

4 KELSEY-HAYES PLANTS IN MICHIGAN

**MCKEESPORT, PENNSYLVANIA • LOS ANGELES, CALIFORNIA
• DAVENPORT, IOWA • WINDSOR, ONTARIO, CANADA**

NIAGARA



Extensively used in mass production of aircraft, tank and ordnance parts requiring pressures up to 190 tons.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

A COMPLETE LINE of INCLINABLE PRESSES

13 SIZES...

6½" to 1¼" Diameter Shafts

For your defense contract work,
get Niagara presses to insure
maximum output, long die life
and uninterrupted production.



Widely employed in quantity production of small components for the aviation, ordnance and electronics industries.

Manufacturers of a complete line of sheet metal working equipment ranging from small hand tools up to large power operated machinery.

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

NEW PRODUCTS

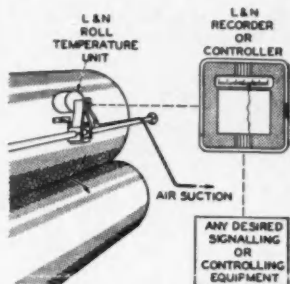
(Continued from page 80)

C-98—Roll Surface Temperature Detector

A new roll surface temperature unit developed by Leeds & Northrup Co., Phila., Pa., measures temperature of a moving roll surface without touching

the roll, thereby not scratching, scoring, or in any way destroying delicate surface films. Temperature detected by the unit is recorded automatically by either a Micromax or Speedomax instrument supplied as an integral part of the complete equipment. The recorder can be equipped to operate signals or controls. Applicable to roll diameters down to

For additional information please use coupon on page 56



Leeds & Northrup roll surface temperature measuring unit.



It will pay you to call in your Honeywell Supplies Man . . . today!

WISE BUYERS benefit from the provisions of the HSM Plan for all pyrometer supplies purchasing. Just like the buyer shown above in a discussion of thermocouple extension wire with Bud Tovig, Honeywell Supplies Man from our New York office.

The HSM Plan includes a realistic survey of your pyrometer supplies requirements, a listing of the specific items such as thermocouples, protecting tubes, extension wire, charts, etc., a breakdown according to planned and periodic purchasing, and a contract which fea-

tures a marked reduction in your total cost. Once the plan starts to operate, it's practically automatic . . . gone are the days of confused specifying and hopeful waiting for delivery.

Call in your Honeywell Supplies Man, today . . . he is as near as your phone.

Stocks maintained in Philadelphia, Cleveland, Chicago, Houston, Los Angeles and San Francisco. MINNEAPOLIS-HONEYWELL REGULATOR CO., Industrial Division, 4548 Wayne Ave., Philadelphia 44, Pa.

Honeywell

BROWN INSTRUMENTS

9 in. and to flat surfaces, the new detecting unit operates independent of surface speed, emission characteristics, and finish. It can be mounted at the center of the roll or at any other location, wherever actual temperature measurement is desired.

This new primary element works on the principle that a moving object carries with it a thin, closely adhering layer of air nearly the same temperature as the moving surface. Mounted 1/32nd of an in. from the surface is a measuring head, contoured to fit the roll. A continuous stream of air is sucked past the measuring element and thus heats it to virtually the same temperature as the roll surface.

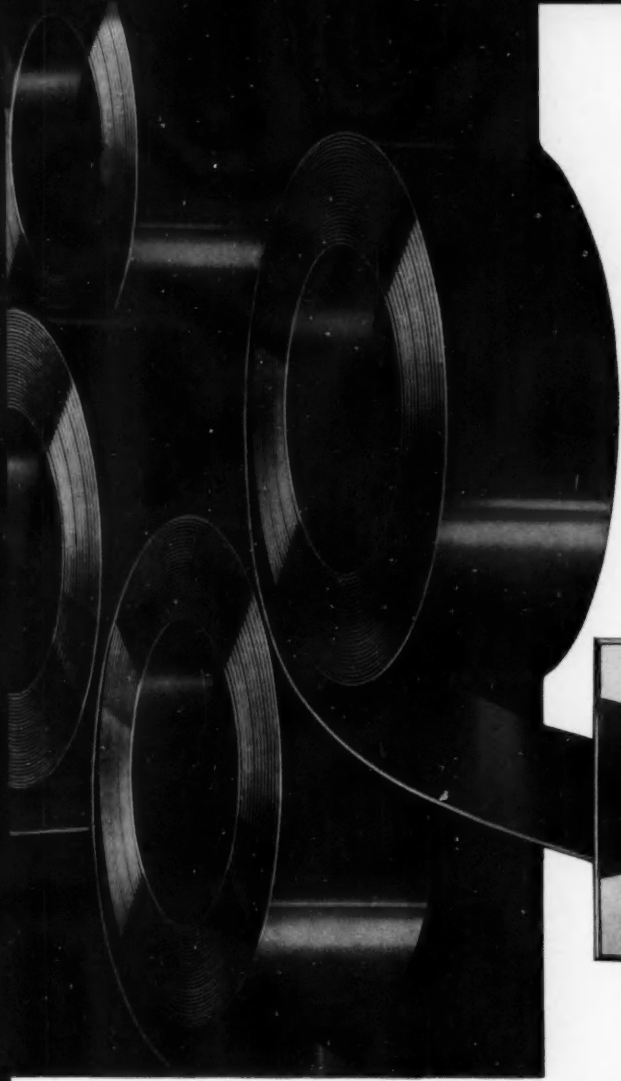
Although recorded temperature is a few degrees lower than true surface temperature, the difference remains substantially constant and is therefore negligible in process control (-4 F or less). The unit provides temperature measurements well within limits of industrial requirements. Air suction rate and surface speed are non-critical over wide limits. Measurements are not appreciably affected by ambient temperature.

Compound joint with spacing slide makes it easy to position the measuring head concentric with the roll and at proper spacing. Should material adhere to the roll surface, a safety bumper retracts the measuring head. The unit can also be supplied with a safety switch which operates in conjunction with this retracting device. This safety actuates a bell, horn, or light to signal the operator and freezes the control until the measuring head is reset.

C-99—Luminescent Packaging Tape

Luminescent packaging tape developed by Century Coating Co., White-stone, L. I., New York, can be seen easily from a distance of several feet in blackout areas, and is used to seal and mark boxes and containers of all sizes and shapes for ready identification in the dark.

(Turn to page 87) please)

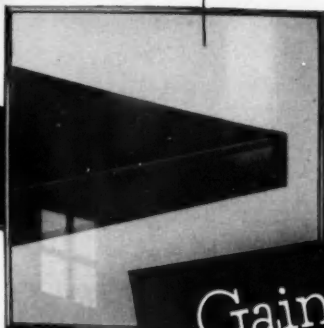


where

copper's
face value counts

and

steel's
strength and
economy are needed . . .



Gain both

with

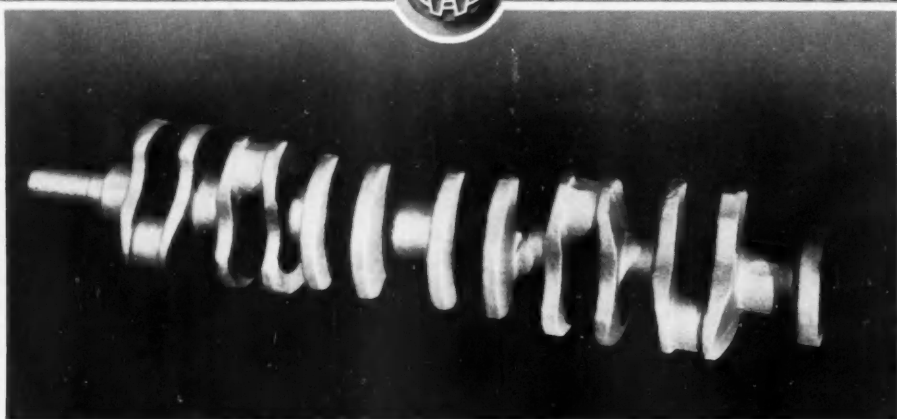
SuVen[®]eer
COPPER CLAD METAL

Write to our Sales Department
for fuller information on Su-
Ven[®]eer Clad Metal, and any
assistance you may desire
in developing projected ap-
plications. No obligation of
any kind.

Superior Steel

CORPORATION
CARNEGIE, PENNSYLVANIA

SuVen[®]eer Clad Metal gives you copper bonded in-
separably to plain steel strip, on one or both sides
. . . providing the advantages of all-copper surfaces,
while saving solid copper for defense needs. Your
costs are lower with SuVen[®]eer Clad Metal, wherever
it can take the place of solid copper . . . and your
product performance is increased with the added
strength of steel!



The Crankshaft

—backbone of the internal combustion engine.

Modern Trends—more r.p.m.'s, higher compression ratios, more power per cubic inch of displacement—all lend additional emphasis to the importance of crankshaft quality.

Wyman-Gordon Experience—the most extensive in the industry, assures the maximum in physical properties, uniform machinability, and balance control.

Standard of the Industry for More Than Sixty Years

WYMAN-GORDON

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL

WORCESTER, MASSACHUSETTS

HARVEY, ILLINOIS

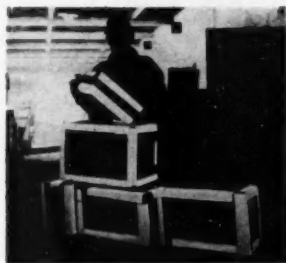
DETROIT, MICHIGAN

NEW PRODUCTS

(Continued from page 84)

To instill toughness, abrasion and chemical resistance, and flexibility in hot and cold weather, and to insure a moisture-proof coating for the luminescent pigment, a plastisol made from Geon paste resin, a B. F. Goodrich Chemical Company product, is used as a coating for the "glowing" tape.

A succession of plastisol coatings or layers are put on fabric in six passes



Century Co. luminescent packaging tape.

through a spread coating unit; the top layer is a clear 2 mil film under which is the pigmented luminescent layer, and then base coats. After the various coatings are applied, the 36 in. wide fabric is cut to usable roll 4 in. wide. The adhesive is protected while not in use by covering which is easily stripped off.

The use of plastisols made from Geon paste resin reduces fire and toxicity hazards by eliminating solvents or diluents frequently employed in fabric coating, the company points out.

C-100—New Tungsten Electrode

A new tungsten electrode brought out by the General Electric Co.'s Welding Divisions, Fitchburg, Mass., for reducing inert-arc welding costs, will find major use in inert-arc welding with direct current, straight polarity, using either argon or helium gas. This type is usually used to weld mild steel, stainless steel, copper, and alloys, G-E engineers said.

The new Hi-Thoria tungsten electrodes will produce a stable arc over a wider range of currents and will resist contamination by weld metal, according to the engineers, resulting in over ten times normal life. Hi-Thoria tungsten has strength comparable to standard pure tungsten.

It is pointed out that the end of a

standard tungsten electrode when subjected to arc temperatures tends to become molten and forms a round shiny surface. The molten surface sputters off into the work in relatively large quantities on arc starting and in minute quantities from time to time when welding, so that the tungsten is slowly consumed, G-E engineers explained.

For additional information please
use coupon on page 56

By contrast, Hi-Thoria tungsten runs cooler than standard tungsten and does not become molten. The end remains square and intact and consumption is reduced. According to the engineers, it is seldom necessary to stop welding in order to clean or break off the end of the electrode. The arc tends to stay under the electrode and will not wander or climb up the electrode at low currents, assuring consistent ease of operation. Touch starting is easily accomplished with currents as low as 5 amps.

Hi-Thoria tungsten, however, is not

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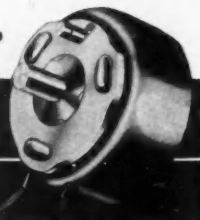
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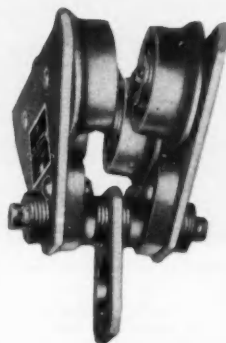
NEW PRODUCTS

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recommended as a standard tungsten replacement for reverse polarity d-c, a-c welding, or atomic-hydrogen welding.

The new Hi-Thoria electrode is manufactured in three to twenty-four in. lengths and from 0.040 to 3/4 in. diam.

C-101—Line of Lightweight Trolleys



Wright Hoist Division of American Chain & Cable Co., Inc., York, Pa., is producing a line of low cost, lightweight, compact Wright-Way trolleys of 1/2 ton to 3 ton capacity, for industrial applications not requiring the high efficiency or high safety factor of Wright, Timken, Hyatt or S.A.R.B. trolleys. Wright-Way trolleys are described as reasonably efficient, easy rolling units that are safe and durable. They provide chilled tread wheels; husky roller bearings; heavy steel axles; equalizing pin and bracket strap; heavy fabricated steel side plates, and they have a safety factor of three to one minimum on all sizes. Trolleys are plain, built only for standard I-beam sizes.

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—Transcontinental Bus System, Dallas.

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—Canadian Oil Companies, Ltd., Toronto.

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—Rodgers Motor Lines, Inc., Swanton, Pa.



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GABRIEL

TRUCK & BUS
SHOCK ABSORBERS

Economy Run

(Continued from page 44)

mpg above the 22.07 mpg average in 1950.

There are several outstanding points apparent in the official results of the 1951 Mobilgas Economy Run. Certain cars with completely newly engineered components showed a very definite improvement over the same make and model of car in the 1950 Mobilgas Economy Run. For instance, it was apparent that the new V-8 overhead valve engines have been engineered with much better combustion charac-

teristics, lower frictional losses and less loss to coolant and exhaust than the engines they superseded in the same make and model car. In spite of the increased performance of these engines, they showed a better over-all economy under the more severe conditions listed above. It is clearly evident that the engineering effort put into these engines in terms of combustion chamber, induction system, manifold-ing, carburetion, and ignition design, as well as the lowering of friction, inertia and vibration losses, has paid off.

On the other hand, certain cars in which the engines have not been radi-

cally redesigned showed a very favorable improvement in their over-all results as compared to the 1950 Mobilgas Economy Run. In checking over the Contest Board AAA inspection records, it is clearly noted that a complete redesign of the carburetor ignition control has been made. This improved control can be assumed to have allowed a more efficient operation of the same engine design under the tremendous variation in atmospheric pressure, ambient temperatures and relative humidity.

In this connection, it may also be noted that some of the cars using engines that have not been completely redesigned, but that did obtain a more favorable economy operation, had changed their engineering specifications for the 1951 models to include coolant thermostats which were probably more accurate in their operation under all conditions of pressure and temperature. These thermostats would not be as subject to change in their calibration under varying coolant pressures and velocities or under severe changes of altitude.

It seems from a study of the official results that the torque and speed relationships between the newly designed engines, hydraulic drives and automatic transmissions, and axle ratios are apparently better than were the same drives with the engines previously used. Therefore the records made with this combination under general western touring conditions were much more favorable than previous experience and prediction would have indicated.

The Contest Board AAA rules require that a driver specify in even gallons the amount of fuel he desires at each intermediate refueling station. If a driver requests more gasoline at these points than his tank will hold, he is charged with the amount he originally orders. One interesting comparison between hydraulic drive automatic transmission and an identical engine with conventional drive cannot be accurately made in the 1951 Mobilgas Economy Run because the driver of the automatic transmission car inadvertently ordered 1.4 gallons more fuel at a refueling station than his tank would hold. The exact results of this unfortunate occurrence cannot be calculated because the driver's technique for the remainder of the course would probably have been different had this not occurred. It is at least of great interest to note the fine performance demonstrated by a number of cars employing hydraulic drives of one type or another.

To take advantage of early timing for maximum performance at high elevations, it was deemed advisable by many of the drivers to use Mobilgas Special to eliminate excessive pinging at sea-level operation. A number of drivers therefore selected Mobilgas Special who would normally use Mobilgas Regular for average driving conditions with timing set for sea-level driving.



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For in this entirely new kind of transmission, one lever controls 10 speeds forward without gear splitting—and every ratio is a usable ratio in equal, selective, progressive 28% steps.

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No Gear Splitting—Equal, progressive and selective ratios permit

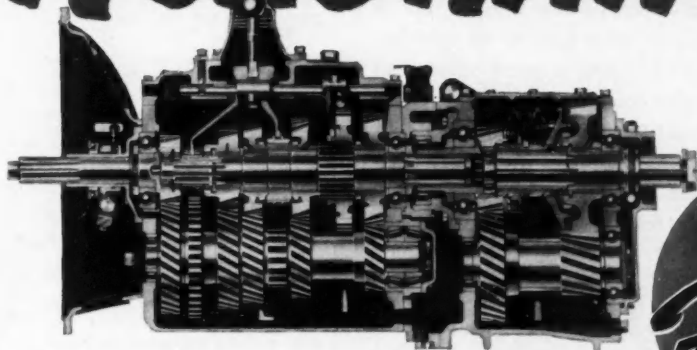
quick, fast shifts, just right for road and load conditions, with only one range shift throughout the progression of 10 speeds . . .

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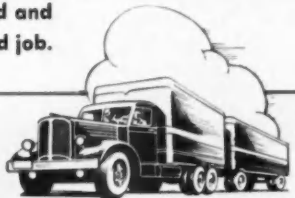


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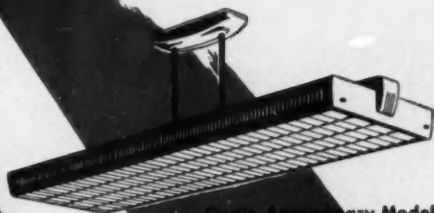
CALENDAR

OF COMING SHOWS AND MEETINGS

Conventions and Meetings

- Amer. Soc. Lubricating Engrs.,
Phila.Apr. 16-18
- SAE National Aeronautic and Air-
craft Engine Display, Hotel Stat-
ler, N.Y.C.Apr. 16-18
- Amer. Mgt. Assoc., Nat'l Packaging
Expos., Atlantic CityApr. 17-20
- 1951 Metal Powder Show and 7th An-
nual Meeting of Metal Powder
Assn., Cleveland, OhioApr. 25-28
- Chamber of Commerce Annual Mtg.
Washington, D. C.Apr. 30-May 2
- Materials Handling Conference, Chi-
cagoApr. 30-May 4
- A.E.R.A. Convention, ChicagoMay 7-9
- Society for Experimental Stress An-
alysis, National Bureau of Stand-
ards, Wardman Park Hotel,
Washington, D. C.May 16, 17, 18
- Amer. Society for Quality Control,
ClevelandMay 23-24
- Third World Petroleum Congress,
The Hague, Scheveningen, Hol-
landMay 28-June 4
- SAE National Summer Meeting,
French Lick, Ind.June 3-8
- American Gear Manufacturers Assn.
(Annual Meeting), Hot Springs,
Va.June 4-6
- American Society of Mechanical En-
gineers semi-annual meeting, To-
ronto, CanadaJune 11-15
- American Society for Testing Mat'ls
Annual Meeting, Atlantic City,
N. J.June 18-22
- SAE National West Coast Meeting,
Seattle, Wash.Aug. 13-15
- First European Machine Tool Ex-
hibition, ParisSept. 1-10
- SAE Tractor and Production Forum,
Milwaukee, Wis.Sept. 10-13
- Sixth National Instrument Conference
and Exhibit, Houston, Texas
Sept. 10-14
- American Society of Mechanical En-
gineers (fall meeting) Minne-
apolis, Minn.Sept. 25-28
- Nat'l Metal Trades Assn., Chicago,
Ill.Sept. 26-28
- SAE National Aeronautic, Production
Forum, And Display, Biltmore
Hotel, Los Angeles, Calif.Oct. 2-4
- National Metal Congress and Ex-
position, Detroit, Mich.Oct. 15-19
- SAE National Diesel Engine Meeting,
Drake Hotel, Chicago, Ill.Oct. 29-30
- SAE National Transportation Meet-
ing, Knickerbocker Hotel, Chi-
cago, Ill.Oct. 29-31
- SAE National Fuels and Lubricants
Meeting, Drake Hotel, Chicago
Ill.Oct. 31-Nov. 1
- American Society of Mechanical En-
gineers (annual meeting)Nov. 25-30

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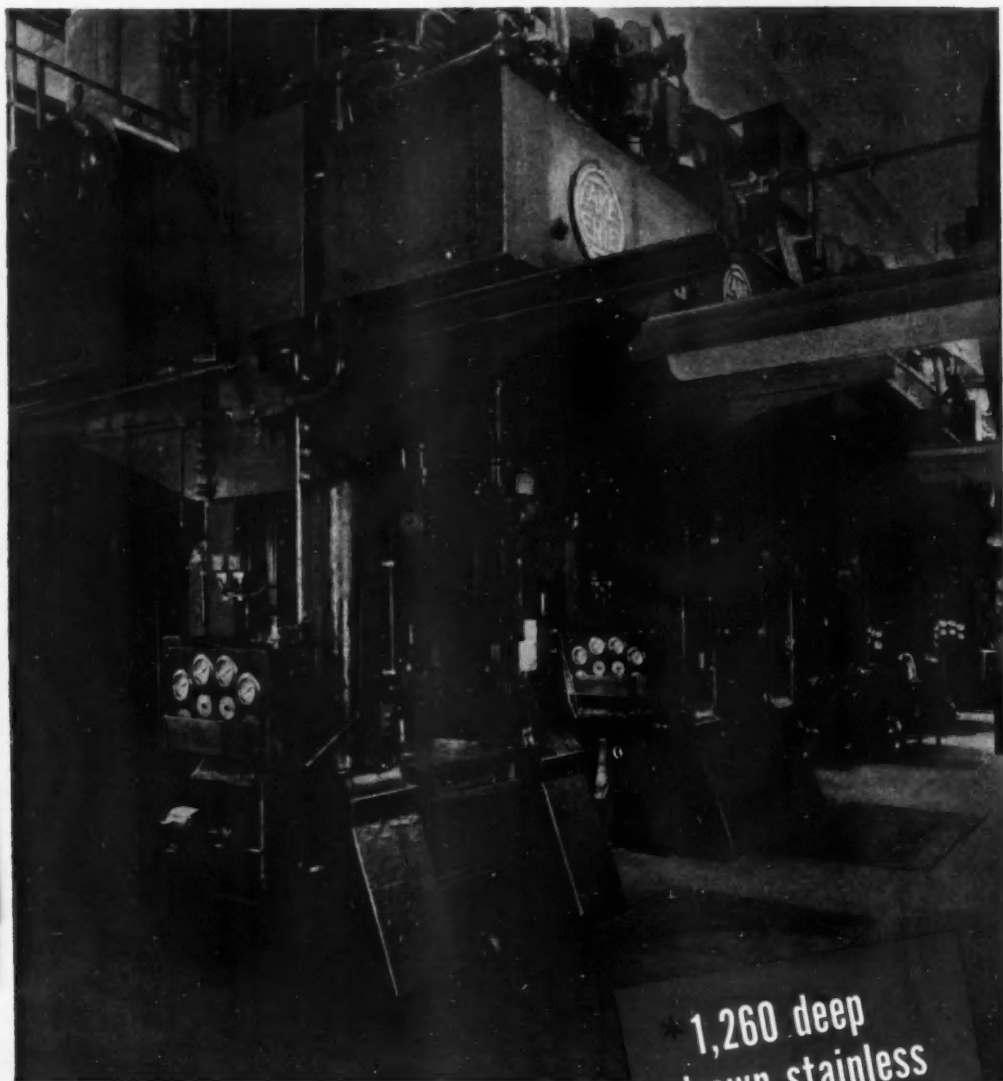


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Business Pulse

(Continued from page 50)

—the special exemption of farm products from general price control under the terms of the Defense Production Act. Several bills designed to strike at the inflationary aspects of the present farm policy are reportedly under consideration in Congress. One proposal is to tighten the controls over farm prices that are permitted by present legislation; another is to abolish farm price supports altogether. Some Administration officials and Con-

gressmen representing agricultural areas oppose such measures. When ceilings were placed on the price of cotton, one cotton-State Senator described the action as being "perfectly silly." The Secretary of Agriculture has termed criticism of farm price supports "loose talk." Nonetheless, many observers feel that preferential treatment of the farming segment of the economy may seriously endanger any over-all control program.

The old problem of reconciling price stability with the necessary incentives to supply is still another difficulty Washington officials must solve. This problem has lately appeared in an acute

form in the copper and lead industries. Price ceilings on finished products prevent these producers from buying raw materials abroad, where prices continue to advance. A critical situation has developed wherein deliveries of metal to fabricators are running far below consumption and yet domestic refiners are forced by economic necessity to curtail their output. Unless prices decline on the world market or future policy revisions allow profitable imports of these commodities, supply is expected to be tight in coming months.

Higher Taxes Delayed

The House Ways and Means Committee has continued its comprehensive examination of all sources of new tax revenue. The thorough and leisurely scanning of tax proposals is interpreted by most observers as being tantamount to rejection of President Truman's request for quick enactment of a \$10-billion tax rise. By the time general hearings ended on March 19, hundreds of witnesses, among them members of the House and Senate, had appeared to offer suggestions and, in many cases, protests.

Meanwhile, an organized demand for a multi-billion-dollar cut in Federal budget estimates for the fiscal year 1952 has gained momentum as several groups have presented studies urging preparation of new budget figures several billion below those now being considered by the House. Senator Byrd, an outstanding Senate advocate of economy, has declared that "We are confronted with one of the most serious situations this nation has ever faced."

The situation itself, according to Senator George, is likely to remain static on the income side at least until July. Mr. George, chairman of the Senate Finance Committee, believes there is little possibility that any new levies, except perhaps those on corporations, can be effective by July 1. Others doubt that the next round of income-tax increases can be made effective before October. In view of the widespread disapproval in Congress of retroactive taxation at present, many observers feel that the Government will not be able to secure revenue quickly enough to balance the budget for 1951-52, even if rates are raised as steeply as the President requested.

The report that Secretary Snyder will appear again before the committee early in April has given rise to some conjecture as to whether the Administration's original demand for \$16.5 billion in new taxes may not be considerably reduced. The possibility that upward revisions may be made in estimates of revenue to be received from existing tax sources and that expenditures may be lower than anticipated are seen as possible grounds for substantial reductions in the apparent need for additional taxation.

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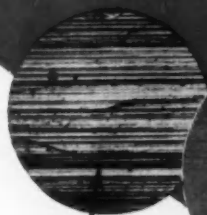
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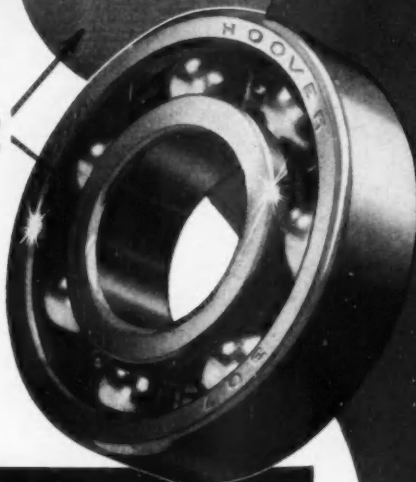
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The Aristocrat
of Bearings

Motor Vehicles of Russia

(Continued from page 33)

retains the characteristic BMW grill and body lines, while the smooth streamlining of the sedans is a new departure. From the front, the BMW 342 sedan is similar in appearance to some of the more expensive British "saloons," such as the Bristol 401, while the recently-developed BMW 343 has taken on a heavy chromium-plated grill and front bumper.

A number of trucks, also manufactured under the aegis of IFA, were shown at Leipzig. Next to the DKW F8 already described, the Framo V 501 is the lightest in this line. This is a $\frac{1}{4}$ -ton delivery wagon with rear wheel drive, and a two-cylinder, two-stroke engine of 30 cu in. which is rated at 17 hp. The two-ton Phänomen Granit 27 is available with dump, panel truck and ambulance bodies, and is powered by a four-cylinder air-cooled engine with a displacement of 164 cu in. and developing 50 hp.

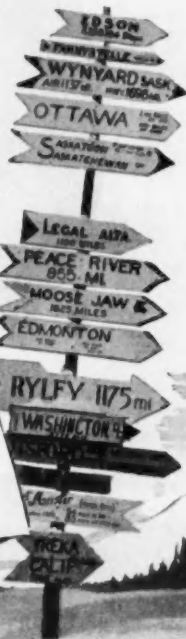
The heaviest truck exhibited was the three-ton Horch H3A, Diesel powered with a four-cylinder, 80 hp, 366 cu in. engine. This has five forward speeds but drive only to the single rear axle. The H3A engine is used in the tractor of the IFA ST 60 tank trailer combination, the tank having a capacity of 1200 gallons. While ruggedly built, this combination presents a rather incongruous appearance, for the tractor has the characteristic German overhanging engine and long blunt hood, while the streamlined trailer has more of the American styling.

East German production of passenger cars last year was about 10,000 units, and a yearly output of 25,000 is planned for 1955. 2400 trucks and commercial vehicles were produced in 1950; this is expected to reach 24,000 in five years. Three types of Diesel tractors are being manufactured, rated at 22, 30 and 40 hp (a total of 5000 units last year—12,000 in 1955), and a number of four-wheeled trailers, including one with a five-ton dump body which can be tipped in three directions with a hydraulic lift.

Three makes of Soviet passenger cars were being shown at the Leipzig Fair. The Pobeda M-20, similar in appearance to an early postwar Chevrolet, is made in two-door sedan and convertible models. Produced in the Gorki works, this has a four-cylinder, 122 cu in., 50 hp engine. The latest Russian car is the Zim, manufactured at the Molotov Motor Works in Gorki. This has a six-cylinder engine developing 95 hp at 3600 rpm; maximum speed is claimed to be 80 mph and average fuel consumption about 15 mpg. Body styling of the four-door Zim sedan, the only model so far being produced, is moderately streamlined with heavy chrome

(Turn to page 102, please)

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Climbing production curves necessitate squeezing out every possible productive minute from every production machine. There's no time for motor and control "time out". Together or individually, Life-Line motors and starters offer the best assurance of continuous production. They are built to—

STOP outages due to improper bearing lubrication. Life-Line motors, with their pre-lubricated, sealed-for-life bearings, need no lubrication. Grease guns can be thrown away—motor lubrication schedules forgotten.

STOP outages due to cracked and broken motor frames. Life-Line motor frames stand up to the hard knocks of day-to-day use. They're steel. More protection is afforded with less size and weight. This rigid frame maintains bearing alignment and positive rotor air gap.

STOP outages due to burned and pitted starter contacts. Life-Linestarter's® exclusive "De-ion®" arc quencher quickly extinguishes destructive arcs. The "De-ion" grid snuffs out arcs . . . contacts last longer.

STOP outages due to inadequate overload protection. Life-Linestarter prevents motor burn-out due to overloads. The bimetallic, snap-action, disc type of overload relay shoulders the burden. Precise calibration . . . not affected by aging or oxidation.

Other Life-Line features that will aid you in meeting increased production schedules are covered in "Life-Line Book", B-3842 and "Tomorrow's Starter Today", B-4677. Ask your Westinghouse representative for your copies. Or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-21642

YOU CAN BE SURE.. IF IT'S
Westinghouse

Life-Line

MOTORS and CONTROLS



grill and wrap-around bumpers. Features include flashing turn indicators in the parking and tail lights, gear shift and turn indicator levers on the steering column, electric windshield wipers, independent front wheel suspension with coil springs, and fluid drive.

The largest Soviet car is the Zis 110, manufactured in Moscow, and powered by an eight-cylinder, 366 cu in. engine which is rated at 140 hp at 3600 rpm. This is produced in limited numbers and only for official use, the body being a seven-passenger sedan. The little Moskvitch, which attracted considerable attention at the recent Brussels Motor Show and which is the USSR's

bid for the Western markets, was not being shown. It is understood to be very similar to the pre-war German Opel Cadet.

Czechoslovakia was exhibiting at Leipzig three models of the Skoda 1102 and one Tatra. The latter features a four-cylinder air-cooled engine placed at the rear. The older eight-cylinder Tatra is reported to be going out of production and a six-cylinder Tatra is being prepared. Czech production of passenger cars last year is estimated at 17,000, and assuming a continuation of the present rate of increase, the annual rate should be double this in five years.

BOOKS...

MACHINABILITY AND MACHINING OF METALS, by Dr. Norman E. Woldman and Robert C. Gibbons, published by McGraw-Hill Book Co., 330 West 42nd Street, New York 18, N. Y. Filling a definite need for up-to-date information on the machinability of metals and alloys in use today, this new book is well timed to meet the problems of the current war program. Each group of metals is treated separately with sections on low and high-carbon steels, tool and die steels, stainless steels, and cast irons. Aluminum, magnesium, copper, nickel, and zinc-base alloys are likewise discussed. Of special value is the coverage of new developments such as theoretical considerations of machinability, including mathematical derivations; machining of the light metals such as aluminum and magnesium; machining the hard, high temperature alloys and the refractory metals such as molybdenum, tungsten, etc.

OXYGEN CUTTING, by George V. Slottman and Edward H. Roper, published by McGraw-Hill Book Co., 330 West 42nd Street, New York 18, N. Y. Price \$6.50. The widespread use of oxygen cutting in the production effort of World War II firmly established this process as the standard industrial method for shaping ferrous metal parts for fabrication. With production of armaments and other equipment again a prime industrial objective, the publication of this book is of particular interest. It provides the metal working industry with a comprehensive and authoritative manual of practical oxygen cutting techniques, as well as a summary of our present-day knowledge of the subject. In addition to fundamental information on the action of the cutting jet and the mechanism of the process, the book includes extensive discussions of the many uses to which oxygen cutting may be applied, and presents interesting historical background material.

DIE CASTING, by H. H. Doehler, published by McGraw-Hill Book Co., 330 West 42nd Street, New York 18, N. Y. Price \$8.00. The book presents a clear picture of the possibilities of die casting as a fabricating technique. It discusses the production, engineering, design and materials of die casting, and points out probable trends and developments in the near future. Each aspect of the subject receives full treatment slanted to meet the needs of metallurgists, equipment and product designers, production supervisors, engineers and others directly engaged in the design, production and use of die casting equipment.

THE STORY OF AMERICAN ROADS, by Val Hart, published by William Sloane Associates, Inc., New York, N. Y. Price \$3.00. This book tells why and how American roads were built, and where they led, from the time of the Indian trail to the present super-highway. It also gives the history of some of the people who built our highway system. The appendix lists the routes of principal named highways in the United States.

SAFETY IN ELECTRIC AND GAS WELDING AND CUTTING OPERATIONS, published by the American Welding Society, 23 West 39th Street, New York 18, N. Y. Price \$6.50. This American Welding Standard covers regulations for the safe installation and operation of welding equipment for all arc, gas and resistance welding processes. Precautions are specified for the welding of materials which may give off toxic fumes and for welding in confined spaces.

Air Power? Fluid Power?

for Efficient Application and Control of EITHER ...Specify NOPAK Valves and Cylinders

Standard Models meet most application requirements. All 4 classes of NOPAK Cylinder construction are available in 6 standard mounting styles. NOPAK Rotating Disc Valves for low pressures in Hand, Foot, and Solenoid Models; NOPAK Balanced Hy-Pressure Valves to 2000 P.S.I. For complete data and descriptions refer to Sweet's File for Product Designers.

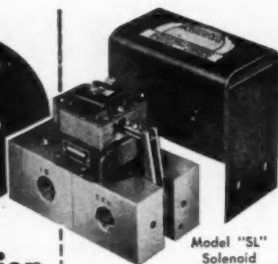
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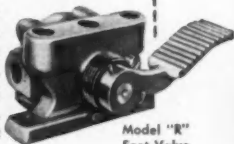
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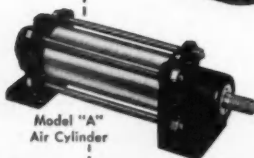


Model "SL"
Solenoid Valve

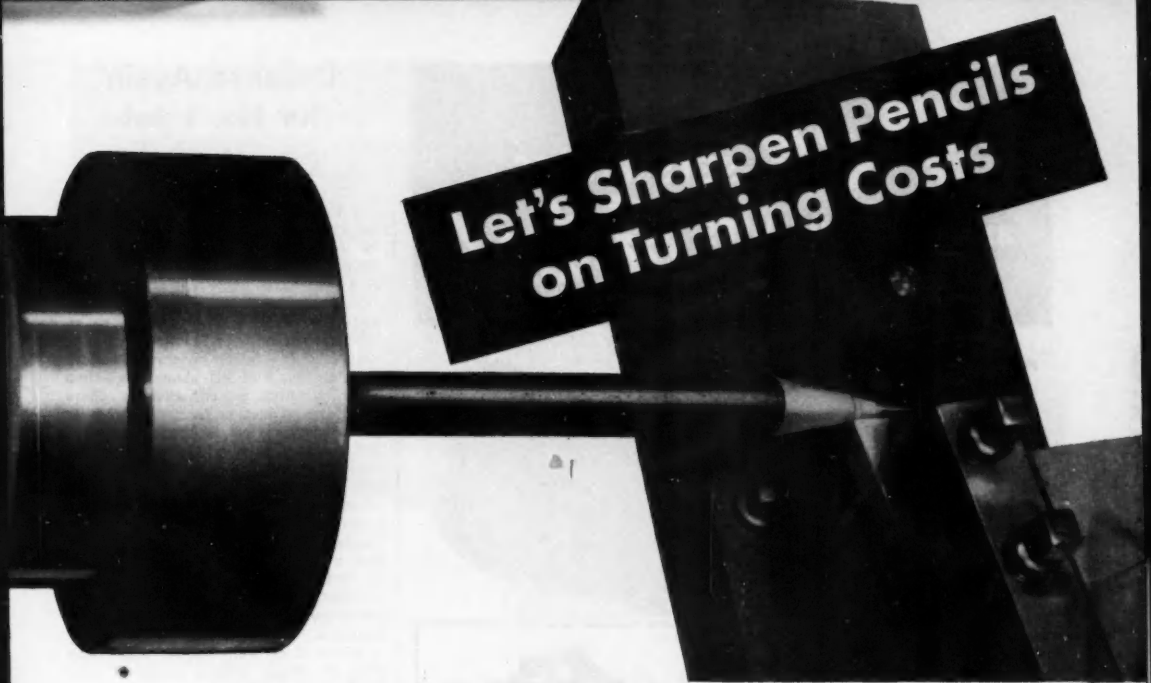
Series 1500
Hydraulic
Cylinder



Model "R"
Foot Valve

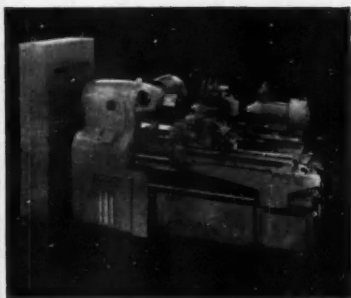


Model "A"
Air Cylinder



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on Turning Costs

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THE MONARCH MONA-MATIC

—the greatest development today for high speed, automatic metal turning. Write for proof in the form of a wide variety of performance records established under typical production conditions.

Have you investigated recent Monarch turning developments? There's only one truly effective way to sharpen your pencil on manufacturing costs today. That's to insist on taking full advantage of modern equipment and methods.

Users of Monarch tracer-controlled lathes, for instance, report time-savings of up to 500% and more. There are jobs where one machinist, operating two single tool tracer-controlled Monarchs, is out-producing 4 multiple tool automatic machines. Or where tool costs alone have been reduced over \$4,000—or setup time by over 27 hours—or subsequent grinding time by 50%. There are Monarch installations

that have written off their costs in less than a single year of cost-saving operation. And please bear in mind that the average set-up time of 15 to 20 minutes makes these modern Monarchs as economical for short runs as for long ones.

You can count on accuracy, speed and long service with every Monarch lathe. And we build almost every type. We can apply any one of our three kinds (3 kinds!) of tracer controls to many of them. Let us give you full details of Monarch Toolmaker's, Engine and Production Lathes—and of Monarch-Keller, Air-Gage Tracer and Motor Trace Controls. Just tell us your interests... *The Monarch Machine Tool Company, Sidney, Ohio.*



FOR A GOOD TURN FASTER — TURN TO MONARCH

T-J SETS RIVETS and CLINCH NUTS *Faster!*

T-J CLINCHOR

... shown here is one of six special 8" throat Underfeed Clinchors used by a large automotive body manufacturer. These Clinchors feed and set 11/16" square cased nuts in outside quarter panels, left and right hand.



Set clinch nuts 3 to 5 times faster with a T-J Clinchor! Fully automatic... controlled by a single foot pedal. Available in Underfeed and Gravity feed models, throat depths 8" to 36".

For high production... T-J Rivitors! Automatically feed and set solid rivets. Set 1/16" to 1/4" diam. solid steel rivets up to 7/8" long using electrically powered Rivitor... aluminum alloy rivets up to 1/4" diam. or steel rivets up to 1/8" diam. and up to 3/4" long, using air powered Rivitor. Throat depths, 8" to 36".

Speed up assembly in aircraft, farm machinery, automotive, stampings of all kinds... with T-J dependability! Write for Clinchor bulletin 847; Rivitor bulletins 646 and 847. The Tomkins-Johnson Company, Jackson, Michigan.

TWIN RIVITOR used for riveting flat steel springs to mounting brackets for automobile horns.

T-J RIVITOR used for automotive clutch plate assembly. Saves time and labor doing a four-fold job—assembly, setting, inspecting and ejecting.



**35 Years
Experience**

TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

Defense Again the No. 1 Job

(Continued from page 35)

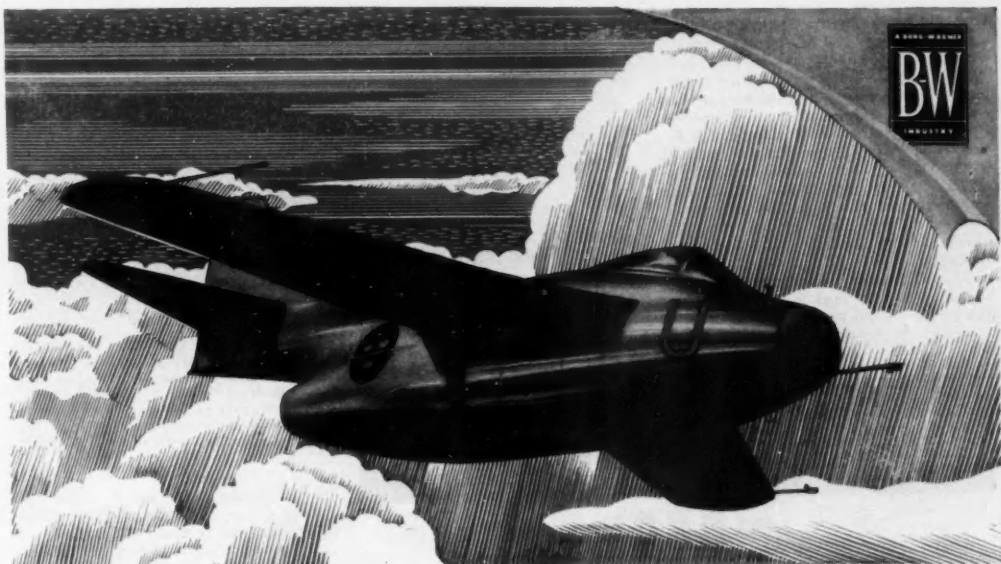
like the 340,000 units by which the industry surpassed the first three months of last year so that, in any event, strictly civilian output was far ahead of a year ago.

As the second quarter gets underway, there are mixed opinions as to how many cars and trucks will be turned out. Some observers believe that the first half will show an all-time record for that period, whereas others look for a reduction from first quarter levels of from five to 15 per cent for the industry as a whole. This divergence of opinion illustrates clearly why it is impossible to make any valid forecasts. In view of constantly changing conditions brought about by Governmental action, the international situation, and the still unknown demands of the defense program, any appraisal of automotive production in the months ahead must be hedged by many qualifications.

While it is well known that more than \$6 billion dollars worth of contracts have been awarded to the automotive industries, it is not clear to the public that these have had little impact yet so far as actual use of critical materials is concerned. Nearly all contracts of any size still are in the very early tooling stages or are not even started, and it will be many months before even the first of them will take any materials in large quantities. On the other hand there has been a rather substantial effect from the stockpiling program and from mill set-asides under Government order. This is particularly true of steel, especially alloy steels, and also of non-ferrous metals.

What actually is happening is that a program of combined operations—military goods and civilian vehicles—is already under way and will be greatly expanded over the next year or two. Spread throughout the vehicle and parts industries are hundreds of small contracts for military items which are being produced in conjunction with civilian goods. The large military items, those that will require large quantities of materials, still are several months to a year away. These include tanks and other combat vehicles, fighter planes, jet engines, reciprocating aircraft engines, aircooled combat vehicle engines, large guns, shells and rockets, and cargo planes. The only large items that now are taking any quantity of materials are military trucks and a fairly sizeable number of passenger cars for use by the Armed Services. These, however, represent only a very small percentage of total vehicle production at the moment.

An interesting development is that, unlike in the early stages of World (Turn to page 106, please)



Another PESCO FIRST...the Unloading Gear Pump ...flies with SAAB at transonic speeds

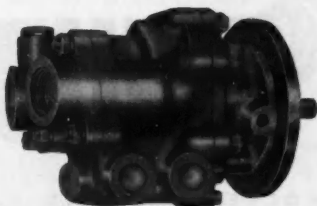
Lighter weight . . . longer service life . . . lower maintenance expense . . . smaller initial cost . . . four good reasons why Pesco's new unloading gear-type hydraulic pump is rapidly replacing conventional variable volume pumps on aircraft . . . particularly jets.

Among the first to take advantage of the many benefits of Pesco's latest contribution to more efficient, more dependable aircraft operation is the famous Swedish SAAB Aircraft Company. Its new SAAB-29, designed to fly at speeds up to the transonic speed range, depends on the Pesco Unloading Gear Pump for all hydraulic operations including landing gear, wing flap, brake operation, etc.

Always alert to the demands of aircraft makers for reductions in weight, elimination of service and maintenance problems, and lower costs, Pesco research engineers are continually

searching for ways to improve present equipment as well as develop new products to meet these important requirements.

It is this constant research that keeps Pesco aviation products standard equipment on military and commercial aircraft. If you have a problem in aircraft hydraulics or fuel handling, perhaps this experience can help you. A Pesco engineer will gladly discuss your problem with you . . . without obligation, of course.



Pesco Model 011799 Unloading Gear Pump. Weight 8.6 lbs. Maximum continuous operating pressure 1500 p.s.i. Capacity 2 g.p.m. at 1500 r.p.m. Features Pesco's exclusive, patented "Pressure Loading" principle. Other models available for pressures to 3000 p.s.i.



PRODUCTS DIVISION

BORG-WARNER CORPORATION

24700 NORTH MILES ROAD

BEDFORD, OHIO

War II, large contracts that require considerable space are not displacing automotive assembly lines in most instances, but are being centered in either former Government war plants or in new facilities being constructed especially for that purpose. Among the few exceptions are Kaiser-Frazer which will carry on cargo plane production and passenger car output under the same roof at the huge Willow Run plant, and the Kansas City B-O-P plant which is being converted to plane production.

General theory behind the building of new plants is that it is cheaper to put up and equip an entirely new unit



This Army T-41 light tank, named the Walker Bulldog for the late General Walton H. Walker, came off the line on March 27 at the Cadillac-Cleveland arsenal and is the first to be produced there. It weighs 26 tons, mounts a new type 76 mm gun, and has a top speed of 40 mph.

CONTROL POWER BETTER

8 out of 9

Major Farm Tractor Manufacturers Use

ROCKFORD CLUTCHES

To Help Make Their Tractors Operate Reliably and Efficiently in the Most Rugged Service

Let our engineers show you how ROCKFORD CLUTCHES will help make your product stand up under the stress of heavy duty work.

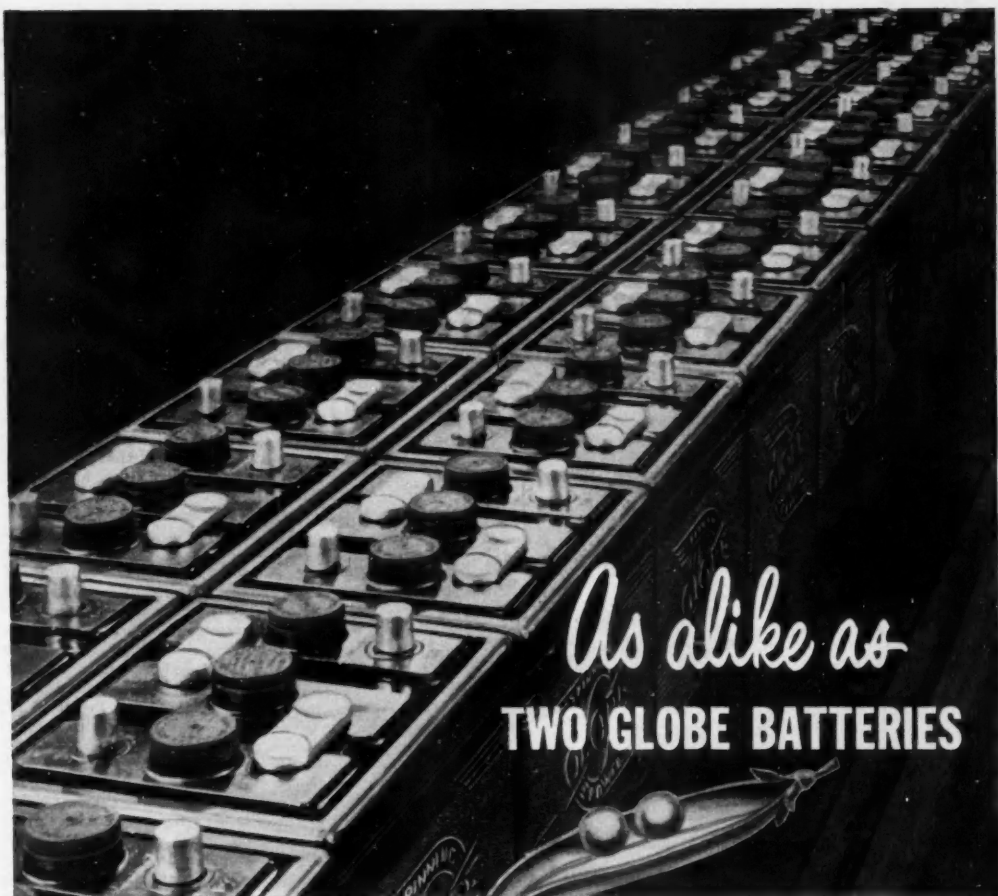
ROCKFORD CLUTCH DIVISION
BORG-WARNER
315 Catherine Street, Rockford, Illinois

ROCKFORD CLUTCHES

for production of a specific item than to rip out equipment from an automobile plant and reinstall tooling for military goods. It also is part of the long-range mobilization program that envisions a separate defense production set of facilities which can be kept in standby condition or in nominal production during times of international stability but at the same time be ready for a rapid expansion into full scale production in time of emergency. Of course, another good reason is that automobile production can be maintained while tooling up for defense orders.

In the immediate months ahead, however, as thousands of prime, sub- and sub-subcontractors fill pipelines under priority ratings in preparation for production, the outlook is for a rather severe pinch in the supply of raw materials, principally steel, rubber, and critical alloying elements such as molybdenum and nickel. Automotive companies report that steel is the most critical problem at the moment, particularly in the alloys. In fact, there is some question that the industry will be able to get enough steel to meet even the 80 per cent of base period production that is allowed during the second quarter. Copper and aluminum, while short, are not critical because the supply of steel is the controlling factor. Rubber on the other hand has assumed a critical role since the Government restricted delivery of tires for new passenger cars, starting April 1, to 25 per cent below the number delivered to each manufacturer during the first quarter. Admitting that the problem can be partially met by leaving off the spare tire as now is being done, there still is a shortage of about five to six per cent below first quarter deliveries and if steel is available for the 80 per cent quota, rubber may be the limiting factor.

One provision of the steel limitation
(Turn to page 108, please)



As alike as
TWO GLOBE BATTERIES

CONTROL-BUILT FOR ABSOLUTE UNIFORMITY

PICK any Globe battery out of the line or off the shelf. It will be like every other Globe-Union built battery of its class, in specifications, materials, performance. Identical equipment and processes are in use at all thirteen Globe-Union factories. Standardization is complete to the smallest detail. Precision production is a fact, not a phrase. That's why, no mat-



ter what your original equipment or replacement requirements may be you can meet them better with Globe-Union built batteries.

"Spinning Power, split second starting, long life" . . . these characteristics for which Globe-Union built batteries have long been noted are dependably yours in every battery, size for size, type for type . . . year after year.



GLOBE-UNION, INC., Milwaukee 1, Wisconsin

Battery Production Plants At:

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Los Angeles, Calif. • Memphis, Tenn. • Mineral Ridge, Ohio • Oregon City, Ore. • Philadelphia, Pa. • Reidsville, N. C.

IN THE AUTOMOTIVE FIELD, TOO . . .

LORD VIBRATION-CONTROL

*is part
of design*



Lord Mountings make the day's work easier for drivers, make the day's travel pleasanter for passengers, and make the journey safer for both. They postpone the day of repairs and replacements and reduce the costs of upkeep.

When you plan new buses, new trucks, new cabs, be sure that Lord Mountings are in the drawings and the specifications . . . make them a part of design. No other expenditure you make will bring as great returns from so small an outlay. Here are some of the places where Lord Mountings will serve you profitably:

- Engine Mounts
- Radiator Mounts
- Instrument Mounts
- Air Condition Unit Mounts
- Ventilating Fan Mounts

Write for your copy of the Lord Natural Frequency Chart and of the Vibration Isolation Chart. Designers and engineers will find them of definite value.

Although defense production is putting a heavy demand on our facilities, LORD will make every effort to supply industrial needs.

LORD MANUFACTURING COMPANY • ERIE, PA.

Canadian Representative, Railway & Power Engineering Corp. Ltd.

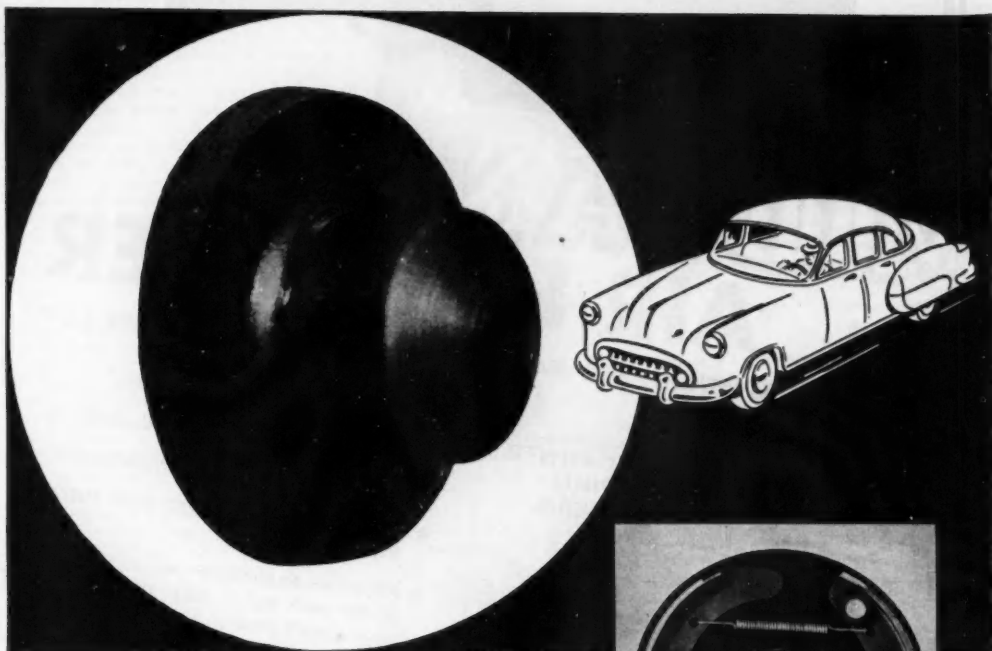


**Vibration-Control Mountings
... Bonded-Rubber Parts**

order may pose a real problem for companies that have been using large amounts of conversion steel. The order specifies that such users must continue to use the same percentage of conversion steel as previously. However, increased ingot capacity plus changes in mill schedules for certain shapes, such as greater demand for armor plate, have resulted in a reduction in the amount of rolling mill capacity available to conversion steel users.

Whether any substantial program of alternate materials beyond what has already taken place will be necessary in the next few months is doubtful at the moment. Actually there has not been too much substitution thus far and a fair statement is that quality of automobiles has not been impaired. There have been some substitutions of iron or steel for certain aluminum components such as clutch housings and bearing caps. It is understood that in one case a manufacturer has gone ahead and substituted cast iron pistons for aluminum on one model, but this is a rare exception. However, with both iron and steel use limited to 80 per cent of the base period, further substitutions of this nature are unlikely. During the first quarter there was no appreciable reduction in use of bright work on passenger cars although there were some modifications of certain exterior moldings and other ornamental trim. In some cases, this took the form of replacing zinc die castings with chrome plated stamped steel parts. Because the Government modified its original orders on use of both nickel and copper, all cars made during the first quarter showed little or no reduction in the amount of bright work. The nickel order was modified to permit using up inventories on hand March 1 and the copper order was eased to permit its use as a base for plating on parts where it previously had been banned. Consequently, it now appears that chrome plating will remain for the time being in the form of chrome directly over copper without the intervening layer of nickel except in bumpers, hub caps, door handles, and a few other minor parts specifically permitted. Durability of the copper-chrome plating has not been established, but it is understood that a coating of clear plastic or lacquer may be applied as an added protection factor. Stainless steel with less than six per cent nickel content is permissible for automotive trim use. Practically all of such trim used in the industry today contains either no nickel or a content well below the maximum so there should be little effect on that type of ornamentation. Prior to the easing of the copper order several companies had developed alternate bright finishes such as chromate overlaid with clear plastic or lacquer, but whether these are used depends upon the copper and chrome situation.

What's U. S. Rubber doing to eliminate brake squeaks?



Located under the vertical leg of a brake shoe, this tiny button or snubber prevents metal-to-metal friction and thereby eliminates squeaks. Made of Enrup, U. S. Rubber's versatile plastic, the button wears better than metal in this application.

It is a typical example of how "U. S." experts work with original equipment manufacturers to add to the efficiency and consumer satisfaction of their products.

PRODUCT OF

U.S. RUBBER
SERVING THROUGH SCIENCE



THE HIGH IMPACT resistance and greater abrasion resistance make Enrup valuable on the brake shoe. The button stands up under the high temperatures generated in the brake during rapid deceleration.

UNITED STATES RUBBER COMPANY
ENGINEERED RUBBER PRODUCTS • FORT WAYNE, INDIANA

Air Over Hydraulic in its Simplest Form!

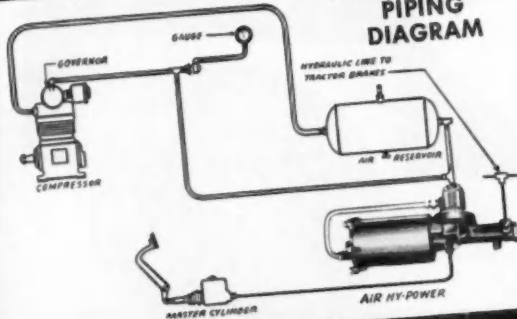


MIDLAND AIR HY-POWER

FEWER PARTS • LESS WEIGHT • NEW SIMPLICITY AND COMPACTNESS • LOWER COST

- ★ LIGHTNING FAST BRAKE CONTROL
- ★ ADAPTABLE TO ALL HYDRAULIC CONTROLS.
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- ★ PROVIDES PASSENGER CAR BRAKE GRADUATION AND "PEDAL FEEL" FOR BOTH LIGHT AND HEAVY UNITS.
- ★ DOES NOT DISTURB THE ORIGINAL HYDRAULIC BRAKE OPERATION IN CASE OF INADEQUATE AIR PRESSURE.
- ★ COMBINED WITH AIR EQUIPPED TRAILERS PROVIDES IDEAL AIR BRAKE CONTROL FOR TRACTOR-TRAILER TRAINS.

**AIR HY-POWER
PIPING
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Air and Vacuum
POWER BRAKES



World's Largest Manufacturer of
AUTOMOBILE and TRUCK FRAMES



Air and
Electro-Pneumatic
DOOR CONTROLS



1951 International Auto Salon

(Continued from page 43)

ment, front wheel drive, four speed transmission with overdrive on high, and independent suspension in front. Smallest of all was the Lloyd with a two-cylinder, two-stroke engine of only 18 cu in. displacement, front wheel drive and a central backbone chassis. D.K.W.-Auto Union had a 42 cu in. two-cylinder, two-stroke engine, also with front wheel drive, while the D.K.W.-I.F.A. was shown with a three-cylinder vertical two-stroke engine, having front wheel drive and independent suspension in front. Borgward-Hansa came into the more conventional class with a 91½ cu in. four-cylinder, valve-in-head engine in a central backbone chassis having leaf-type independent suspension in front. All these models are an attempt to get into the cheap car class to meet postwar economic conditions. Last year German production jumped 108 per cent, with 216,122 passenger cars, 81,745 trucks and 3842 buses. While the demand is increasing and Volkswagen in particular is being very competitive on export markets, the probabilities are that there will be a slowdown this year by reason of the scarcity and increasing cost of raw materials.

Sweden sent her only make of car, the Volvo, with a four-cylinder, valve-in-head 86 cu in. engine. The factory, which has a capacity of 10,000 cars per year also builds a six cylinder model, which is reserved for the home market, the four only being exported. The Volvo features a unit body and frame construction, the all-metal body having side rails extending forwards beyond the cowl, to which are bolted the grouped power plant and suspension constituting an integral unit. Front suspension is by conventional support arms and coil springs, while a rigid axle is used at the rear, with coil spring suspension, inclined radius rods and an antiroll bar. Many of the units entering into the makeup of the car are imported from the United States, while a few come from England. The extension of unit body and frame construction throughout Europe is to be noted, a significant feature being its adoption by firms having a comparatively small production.

Hungary sent one model, the Ikarus all-metal bus, with a four cylinder 85 hp Diesel engine. Designed to carry 40 passengers, it was equipped with a five speed transmission.

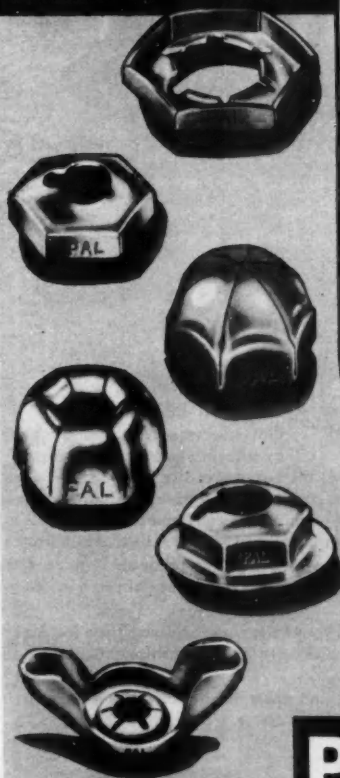
Austrian production was represented by the grouped firms of Steyr, Austro-Daimler and Puch, the vehicles shown being trucks and tractors. Tatra and Skoda represented Czecho-Slovakia, the former with a four cylinder, aircooled rear engine model and the latter with a central tube chassis carrying a four cylinder, vertical 67 cu in. engine.

The most costly automobile in the show was an English straight eight Daimler with a touring-limousine body built by Hooper. This featured the Daimler fluid flywheel and the Wilson pre-selective, four-speed transmission. An electrically operated glass division separated the two compartments.

Outstanding in the commercial vehicle section was a new bus chassis built by the Swiss Saurer Co. A few of these

vehicles are already in service in Zurich and others will be operated in Geneva. In this construction the six cylinder supercharged Diesel engine is mounted on the outside of the left-hand side rail, with the head inclined slightly outwards. The transmission is between the two side rails, parallel with the engine, and drive is by a short propeller shaft to a special double reduction rear axle. The 530 cu in. engine

Assemblies Stay Tight —

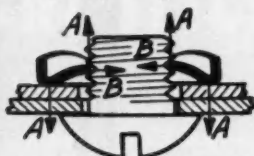


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Detroit Office
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— with PALNUT Double-Locking Action



• When tightened, spring tension (A-A) is exerted upward on the screw thread and downward on the part, while spring tension (B-B) is exerted inward to grip screw thread like a chuck.

For quick, secure
fastening
at low cost!

PALNUT

Trademark

SELF-LOCKING
NUTS AND FASTENERS



One-piece forged part for a large landing gear. 4'1½" long — 2'6½" wide across the "Y" — weight 285 lbs.



Only the best of steel is good enough to take the shock and stress of landing tons of fast moving weight in the heavy planes of today. And the best steel is *forged steel* . . . best in toughness, fatigue resistance, uniformity and savings in weight. The amount of improvement imparted to the steel by forging is determined by the equipment used and the skill of the craftsmen.

Kropp forgings are forgings at their best . . . produced with modern equipment by skilled hammermen, die makers and machinists with many years of forging experience.

That's why Kropp is depended upon to make so many parts for America's defense . . . thousands of pieces daily for planes, ships, tanks and guns to help keep America strong.

The complete drop, hammer and upset forging facilities of *America's Number One Forge Plant* are at your service.

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has a light-alloy block with cylinder liners and a two-piece iron head carrying pushrod operated valves. A Brown-Boveri exhaust operated blower, with water-cooled body, is used and the output is 150 hp at 2000 rpm. The pump and injection units are naturally on the outside and easily accessible by the removal of a body panel. The injector equipment is Saurer construction. A fluid coupling is incorporated with the engine and from this power is transmitted through bevel gearing and a short cross shaft passing through the side rail web to the two-plate clutch and a hydraulically operated preselective transmission with electric control.

The rear axle is a special double reduction type, the first reduction being by spiral bevel, with a ratio of 13-32, and the second reduction being by spur pinion in the wheel hubs, with a ratio of 15-39.

The bus chassis is built to the maximum dimensions allowed under Swiss law, namely a width of 110 in. and an overall length of 36 ft. Carrying a single deck body, the normal load is 60 to 80 passengers, but at peak periods the number is often 100.

The Zahnradfabrik at Friedrichshafen, on Lake Constance, showed a new four or six speed transmission, which is just about to go into production, full details of which are being withheld until the Frankfurt Fair. Known as the Media this transmission is of the gear type, with constant mesh gears. Each combination has its own friction clutch capable of transmitting the complete torque of the engine. Except for starting away, the main clutch is not used, all the gear changes being made by a finger tip control lever under the steering wheel. Any gear can be engaged up or down, without operating the clutch pedal. Overall length is only slightly greater than that of a corresponding model of synchromesh transmission.

Fiat presented one new model, the "615," 1½ ton truck with a four cylinder valve in head gasoline engine of 85 cu in. developing 39 hp. This model has forward engine under a hood, four speed transmission and open shaft drive to a spiral bevel rear axle. The 640 N 4½ ton truck and the 680/RN 53 passenger bus also were displayed.

The German makers in particular specialized in three to four ton trucks, all with Diesel engines. In the Triro, built at Mockmuhl, the 1000 lb delivery truck was a combination of automobile and motor cycle practice, the chassis frame being automobile type at the rear, with a conventional rear axle and semi-elliptic springs and narrowing at the front to receive a motorcycle type of fork. Mounted behind the forward up-swept portion of the frame was a single cylinder, two-stroke engine, with clutch and three-speed transmission and open shaft drive with rubber joints to the rear axle. A similar type of three-wheeler was shown by Tempo.

Of local interest where mountain



Austin-Western

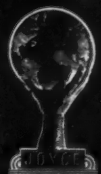


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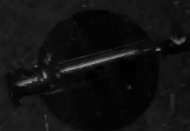
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roads are frequently snowbound was the adaptation of the American Jeep for snow removal by the Robert Aebi Co. A Ford V-8 engine was mounted on the body above the rear axle, and by means of an overhead shaft and reducing gear operated a rotary milling cutter set transversely in front. An additional reducing gear was added to the Jeep to give a rate of advancement varying from 960 yd to 3000 yd per hour at 1000 engine rpm.

The Swiss show comprised an important motor cycle section, a small power boat division and a medium size display of bodywork.

Prices all round showed a slight increase, but there is a belief that this is only the beginning of greater increases. British makers, who in many cases are subsidizing exports at the expense of the home market, state that up to the present they have passed on to the purchaser only the increased cost of raw materials, without any increased labor charges and in some cases with reduced overhead. The threatened increase of labor costs, almost inevitable with the upward spiral of living costs, makes increased cost of automobiles appear almost inevitable. The very serious threat of reduced supplies of raw

materials means that production for the home market will have to be reduced, thus leaving smaller amounts with which to bolster up exports.

Last year Switzerland absorbed 28,248 new passenger cars, this being a record number, 2866 trucks, buses and special vehicles, and 24,786 motorcycles and scooters. The total number of vehicles in operation at the end of last year was 146,998 passenger cars, 38,521 trucks and special vehicles, 2028 buses, 965 tractors, and 75,975 motorcycles and scooters.

Publications Available

(Continued from page 56)

A-108 Hydraulic Presses

American Broach & Machine Co.—Just released is a new pamphlet covering the company's new line of vertical hydraulic presses of 6 and 12 ton capacity. Standard features and specifications are given.

A-109 Cold Headed Fasteners

John Hassall, Inc.—A 34-page catalog, No. 60, illustrates the vast variety of nails, rivets, screws and other specialties available through the cold heading method.

A-110 Viscosity Measurement

Fischer & Porter & Co. — A new catalog now ready for distribution describes Viscorator instruments that provide an instantaneous method for determining viscosity values for industrial processes.

A-111 Electric Wiring

Joy Manufacturing Co.—A 12-page, two-color bulletin, SL-202, on portable light and tool lines is now available.

A-112 Grinders

Landis Tool Co. — A new 16-page catalog describing Number 2 Race-A-Way oscillating cylindrical grinders is now available. This machine is primarily intended for the precision grinding of ball bearing races.

Cal Tech Expanding Jet Laboratory

California Institute of Technology announced an expansion program of \$1 million for its jet propulsion laboratory at Pasadena, Calif. Work is already under way on additional structures to house liquid propellant research quarters, according to Cal Tech officials. The Cal Tech jet propulsion laboratory developed the WAC Corporal rocket.



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Metal Shortages

(Continued from page 47)

in the U.S. However, the entire stockpile of moly has been taken over by the Government. There is no more until the stuff is mined. Unfortunately, it is found at altitudes in excess of 11,000 ft where men can work only at certain periods of the year. Worse still, the cream of high-grade ore has been skimmed. Moly now has to be mined the hard way—tunneling and “caving,” and methods and equipment designed to recover more tonnage at economical cost levels from lower grade ores must be developed. We understand that precisely these measures are being taken, but it will take time before the results in the form of more molybdenum become available.

Freezing of molybdenum has had severe repercussions on the production of alloy steels, on cast irons, and on tool steels.

Copper affects civilian production immeasurably. In automobiles alone, the reduction in copper automatically limits production since there is no practical substitute in radiator construction. At the same time it is the basic ingredient in wiring, and electrical accessories and equipment. Yet, Lund estimates that in 1951 we shall have only approximately 10 per cent more copper than in 1950 with no relief in sight save for perhaps another 10 per cent increase by 1954.

According to Lund, the prospects for lead, zinc, and tin are no better in the foreseeable future.


Tungsten is another hard-to-get item. Civilian-wise we need it in high-speed tool steels, for alloying, for contacts and electrodes, and for cemented-tungsten-carbides. At the present moment its use has not been restricted in the production of tungsten-carbide material for tooling.

Fortunately vanadium is still available as a valuable ingredient in steel making, foundry practice, and for other uses. One of its vital roles in steel making is in the form of the well-known Grainal additions for conditioning low carbon steels.

Were it not for the enormous drain of the military program as well as foreign commitments on the part of the Government, aluminum and magnesium would be in good shape. As a matter of fact, Lund indicates that North American expansions should provide plenty of metal in three to five years. Nevertheless, both aluminum and magnesium have gone to war. Months ago all of magnesium rolling mill capacity was captured for military purposes exclusively.

From the standpoint of automobile production aluminum restrictions will be hard to handle considering its use for engine pistons, brake pistons, and automatic transmission parts. So far

(Turn to page 118, please)



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the functional uses have not been restricted. But, consider aluminum pistons. Even if it were a simple matter to substitute cast iron for aluminum, the change could be difficult or even impractical considering that methods of machining are different and could not be used interchangeably. Worse still, when it comes to the new V-8 recently introduced, changes would have to be made so that the added weight of cast iron would not result in the unbalance of such engines.

Boron alloy steels are definitely in the picture for structural applications. Although they have not been used

widely, there exists not only considerable literature but also a great deal of commercial practice on the part of organizations such as Caterpillar, Timken, IHC and others. Their experience over a long period of time should form a valuable background for wider exploitation of boron steels.

The American Iron and Steel Institute bulletin, dated March, 1951, lists two series of boron steels—80B and 81B—also the 8100 series triple-alloy steels and the modified 8600 series. These are all available as alternate materials of immediate importance to replace alloy steels that have gone to war.

Another of the new engineering materials now undergoing commercial testing is nodular iron—ductile and high tensile cast iron—made with magnesium additions. Max Kuniansky, vice-president, Lynchburg Foundry, gave a brief picture of the work done by his company under license from the International Nickel Co., at a meeting of the American Society for Metals in Detroit in March. This company is producing large castings of heavy sections, small castings, and large high-proof pipe. Kuniansky pointed out that at the present time—at least in his company's experience—nodular iron has not proved economical for short runs or batch type handling. It requires continuous cupola operation coupled with meticulous control of foundry practice and metallurgy at every turn.

Airbriefs

(Continued from page 54)

tain to bring the process into favor on economic grounds.

Royal Wages

The airline pilots, whose top men make \$15,000 to \$18,000 a year on international routes and the average man makes about \$10,000 a year, always present a picture of more humor and less concern when staging their very frequent demands for more money. There is no denying their grave responsibilities—\$1,500,000 and 60 human lives as they approach the airport—nor that they deserve a high level of pay for their exacting work, but it is as though a group of bank presidents went on strike when these smartly-uniformed financiers begin walkout negotiations. Current complaint of American Airlines' pilots is that they are not sharing in the increased productivity of the bigger, faster transports they are flying. They want a maximum number of miles they must fly to receive their monthly salaries, the result being that the faster the airplane the shorter the actual monthly working hours of the pilot. This is an insistent point of the pilots they have raised over the past four years. The company points out that the pilots are already receiving their share of the increased earning power of newer equipment by getting half-again as much to fly a DC-6 as to fly a DC-3. The company also points out that the risks are far less in flying the newer equipment and that the pilot ages continue to climb as a result.

Navigation Funds Cut

The Air Navigation Development Board, an inter-service group dedicated
(Turn to page 120, please)



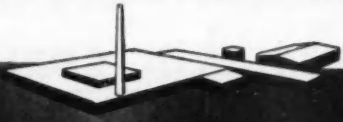
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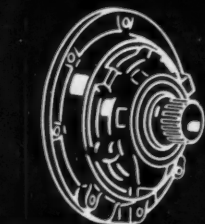


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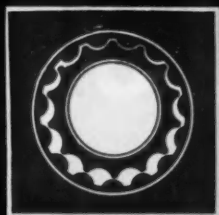


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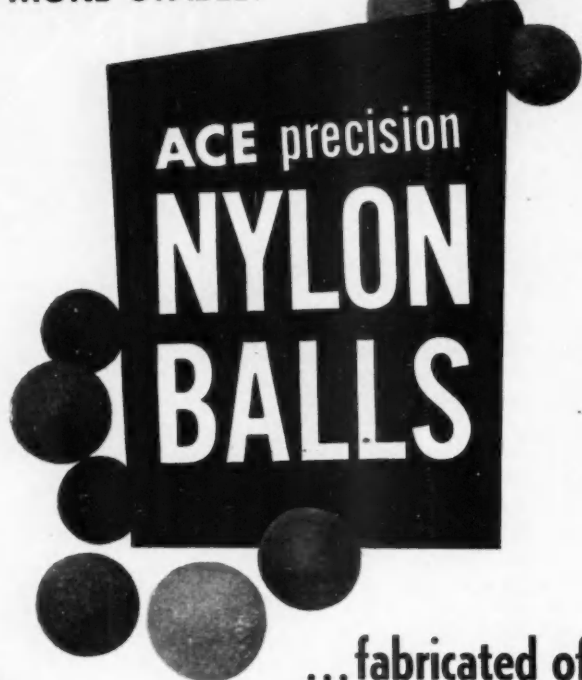
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to completion of the joint or common system of air navigation based on the SC-31 Report of the Radio Technical Commission for Aeronautics, has grown rapidly in the past three years as work progressed on its program. It had been assumed that its work would be of even increased importance during the present emergency but, instead, its funds have been cut from \$8 million to \$5 million, making it necessary to reduce its staff and curtail many of its operations. The reason is a familiar one—the Air Force wants to concentrate on its own tactical communications and navigation aids program for use in the event of an attack and let the common system wait awhile until the situation eases. This means that the single aviation program deemed of paramount importance by all of the industry's leaders must be shelved, at least temporarily, in favor of more urgent military requirements. It's a setback for civil aviation, but one undoubtedly advisable under the circumstances.

New Route Freeze

The Civil Aeronautics Board has decided to virtually freeze any further air route extensions in the United States and, instead, is urging the use of interchange agreements as solution to the problems. Under an interchange agreement, the airplane of one airline continues over the route of another, using the pilots and crews of the second airline, the passengers remaining aboard the same airplane to their destination. For example, an American Airlines DC-6 can fly from Los Angeles to Miami with its passengers undisturbed, although at Dallas, Tex., the plane is taken over by Delta Air Lines crew and flown to New Orleans, where it is taken over by National Airlines crew and flown to Miami. Idea is that competition between these three airlines is reduced, whereas it would be increased sharply by the award of parallel routes separately to each of the airlines. It is a break for the passenger comfortwise, but always a little disconcerting to see one name on the airplane and quite a different name on the caps of the stewardess, pilot and copilot.

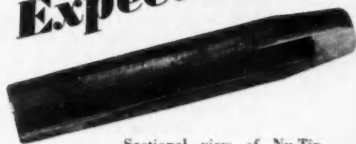
Boeing's Billion

Boeing Airplane Co. reveals that its current backlog tops the one billion dollar mark, which indicates that this company, at least, has broken through to the levels of World War II and war mobilization in the bomber field is well under way.

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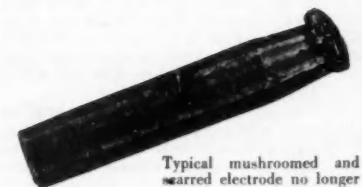
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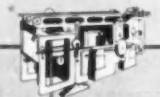
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Optical Tooling a New Technique

(Continued from page 41)

and angular displacement of the beam. This support serves only as a convenient means for universal location of the beam in making optical checks but the beam supporting structure itself need not be precision built and does not have to be placed in precise position relative to the fixture to make the required checks.

In any fixture for precise airframe construction, it is necessary to establish a reference line or lines and two or more locating points either on the line or at precisely specified positions relative to it. The common reference "line" in conventional fixtures is a fine wire stretched taut between supports. From this line, skilled toolmakers lay out the required locating points using scales and other measuring tools. This is an exacting job and is beset with many possible human errors. No wire, however fine, is a line in a true geometric sense and often it is not easy to avoid deflecting the wire in making measurements.

Much more precise work can be done with properly chosen optical instruments and this method has been adopted with much success in the development here described. Transits heretofore employed in some fixture work are not used but a telescope somewhat like that on a transit, is employed. It is located on a support permanently attached to the fixture, not on a movable tripod like that of a transit. In addition, a collimator and other high-precision optical instruments are used.

With these instruments, the reference "line" or "lines" become beams of light, the position of which is established by the instruments between specified points on the fixture. Once a light beam location is established, it can be quickly reestablished in the same location subsequently by a simple setup of the same or duplicate instruments.

The basic line of sight or collimation line is established by aligning the telescope, anchored to a bracket at a specified point near one end of the fixture, with an illuminated target similarly positioned near the opposite end of the fixture. Any number of other collimation lines can be established if needed. Intermediate fixture (locating) points at any desired spacing can be established relative to the collimation line by interposing and aligning an illuminated target (the collimator) on a movable beam in the line of sight previously established. Or, if an optical square is applied in the line of sight, points can be established at any locations in planes normal to the collimation lines.

In a brief article, little detail as to the optical instruments themselves can be given but the principles of operation of the major instruments needed is given in Figs. 2, 3 and 4. A Taylor-

(Turn to page 124, please)

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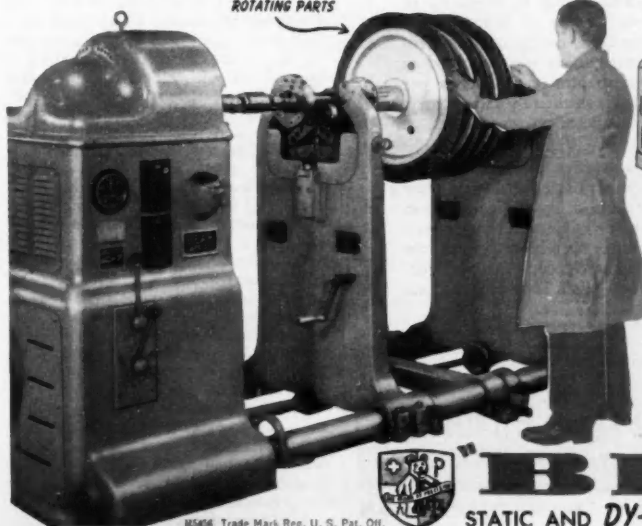
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Here is a typical example. The milling operation on one surface of the aluminum part illustrated—and which is produced in fairly high volume—had been run with a feed of 21 inches per minute. This produced a surface roughness rating of 40 micro-inches. For this part, a 100 microinch finish was specified as maximum. After increasing the feed to almost 50 inches per minute, it was found that the finish still was entirely satisfactory. As a result, machining time for this operation was decreased by more than half!

It is interesting to note that, at Douglas, Profilometers serve a number of departments. They may be used by inspection, by the production standards department or by production departments near the machines on which the surfaces in question are being produced. Douglas recognizes the Profilometer as a *shop instrument*.



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Hobson telescope is chosen partly because its optical axis is precisely centered in a ground steel tube and hence is always coaxial with the ring in which the tube is supported.

Basically, a collimator is a tube containing a light source, a reticle (spelled "graticule" in Figs. 2 and 3) at the focal point of a lens that transmits parallel light beams. When the telescope and collimator are properly mounted with their optical axes coincident, they establish the straight line that becomes the reference line for setting up and subsequent checking of the fixture.

To establish points along this line, the collimator is located on the movable beam supported either horizontally, as in Fig. 1, or vertically by a universal positioner. The beam is of rectangular section and has a series of holes drilled with high precision at known spacing. These holes permit precise location of a collimator adapter or an optical square or both. When these are applied and properly adjusted, Fig. 4, it is possible to determine the distance between the collimation line and the center line of the adapter within a tolerance of 0.001 in.

As the beam can be moved anywhere within the fixture rectangle and to each side of its central plane, any distance required to provide locating points for an assembly to be made in the fixture, it follows that any point on the fixture or the fixture assembly can be checked within unusually close limits. It remains, of course, to check longitudinal distances (parallel to the collimation line) and this is done by the use of measuring rods of calibrated length in combination with measuring buttons on the telescope and the collimator.

To facilitate mounting the telescope, a spherical ring is applied to a tube in which the telescope is fastened. The line of sight then passes through the center of the sphere which rests in a socket or mount attached to a bracket on the fixture. A similar mounting is applied for the collimator, the nodal point of the reticle being in the center of the sphere. The bracket for both telescope and reticle, Fig. 5, provides for vertical and horizontal alignment of these instruments. When aligned, the spherical sockets are locked in position. This facilitates remounting of the instruments when the fixture needs rechecking.

Other instruments needed include an optical square and a stride level, the latter being used to level the telescope and the optical square. Also used are a target reticle installed in a spherical mount and an optical micrometer. The latter promotes accuracy in displacement readings.

In the practical construction of fixtures, an important factor is the correct location of fixture fittings. Such fittings become or contain the actual locating "points" or surfaces that, in turn, establish the critical dimensions (Turn to page 126, please)

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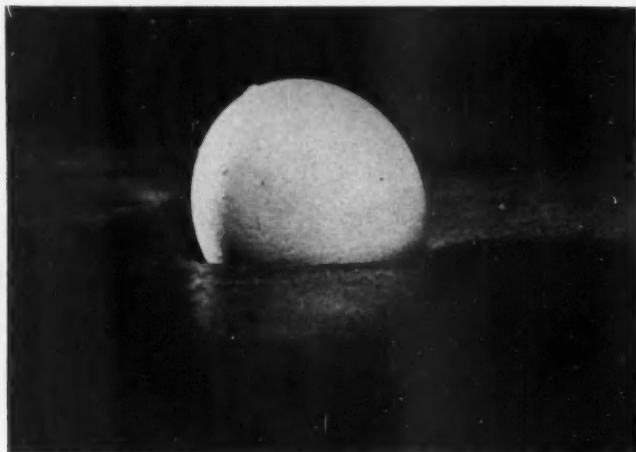
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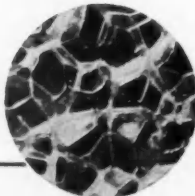
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that the fixture must hold if it is to perform its function.

In conventional fixture making, the fittings are clamped or otherwise supported temporarily in approximate position, are then adjusted, generally by shimmed and, after thus being located, are fastened with dowels, screws or bolts to some support that usually is welded in place when the fixture is built. Such a procedure is slow, tedious and expensive and has to be done by skilled labor. Costs can be lowered considerably if such work can be avoided.

This actually has been accomplished as follows: The locating fitting is made up so as to include the necessary "point" or locating surface and such extensions thereof as are necessary for its support. These include two tubes or pins that will assume a vertical position when the fitting is in correct location. Proper location is determined by supporting the fitting from the universal positioner, as shown in Fig. 6, the precise location being determined by using the telescope, attached to a fixture bracket, and a collimator.

The collimator may be mounted on the positioning beam, as in the figure, or it may be necessary to also employ the optical square. In any case, positioning is such that the fitting is held in the precise location it must occupy when the fixture is finished. This position is fixed optically but, as the positioner beam can be adjusted by hand-wheels on its supporting head, the location is easily and rapidly found and the fitting is held securely where wanted.

When in this position, a casting containing two small cups is bolted to the fixture frame. This casting is so designed and set that the cups surround the two pins or tubes depending from the fitting and are nearly coaxial with them but do not touch these elements. After this relative position is established, molten Cerrotrue is poured into the cups and freezes in the space between cups and pins, binding the two together and firmly locking the fitting where required. If the fitting is below the tube that is to support it, the cups are fastened to the fitting and the casting that is bolted to the tube holds the two bars that are centered in the cups before pouring of Cerrotrue effects the fastening.

Time for this procedure is relatively short, roughly 60 per cent of that for conventional locating procedures in test cases. Once the fitting is properly located by optical means, remaining work can be done largely or entirely by unskilled labor. Moreover, any fixture can be changed or relocated to meet design changes without affecting other parts of the fixture, since no welding is involved.

To obtain time and costs comparisons, records were kept of the man-hours needed in constructing the two fixtures
(Turn to page 128, please)

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shown in Fig. 1. In building the welded structure, conventional wire, plumb line and transit methods were used. Instrument brackets were applied on the welded fixture to permit supplementary optical checks but the time for making and welding them in place is not included in the following comparison because such brackets are not normally applied.

Comparative times for building the welded and cast-and-bolted joint fixtures, Fig. 1, are as follows:

Welded Structure	
Cut and fit pipe	65 man hours
Construct mounting pads ..	6 " "
Construct angles and plates ..	10 " "
Weld structure	10 " "
Install and align fittings..	24 " "
Total	115 " "
Cast Joint Bolted Structure	
Construct 6 fittings and adapter plate	12.5 man hours
Construct 4 instrument shelves	8.0 " "
Cut pipe	8.0 " "
Erection	20.0 " "
Taper pin castings and install fixture cups	6.0 " "
Establish collimation lines and install and align fittings	14.5 " "
Total	69.0 " "

As will be seen, the bolted fixture effected a saving of 46 man-hours or more than 40 per cent in time, even though the men employed were less experienced in fabricating this type than in the welded type. By reference to Fig. 7, it is seen that the degree of precision attained by the two alignment systems is much higher in the optical system, being within 0.002 in. in most cases. Maximum misalignment on the welded fixture was 0.015 in. as against 0.003 in. on the bolted fixture on which the optical positioner was used.

As a check on the rigidity of the two fixtures, both were shifted from their original positions to other locations in the Republic plant and were then rechecked for alignment. It was found that matching points on both remained within the original tolerance, hence no permanent deformation occurred in either case. This would indicate that stiffness is adequate in both types and there is little to choose between the two in this respect.

It is worth noting that data here given apply to the first bolted fixture built, yet it proved equal or superior to the welded fixture on all scores and cost less to produce. Still further improvements are possible through refinements in optical measuring methods already investigated but not here covered. It is also expected that improved accuracy can be attained on spacing by the use of dial indicators at one end of measuring rods. Details in these respects await a further investigation now nearing completion.



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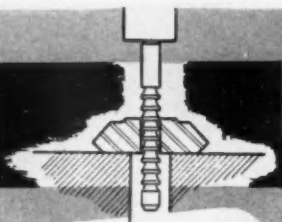
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Page C-4

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New Concepts for Defense Tooling

(Continued from page 37)

For these reasons, the Air Force is currently underwriting a series of comprehensive investigations in most all the fields of tooling.

Due to the varied tooling concepts used throughout aircraft production, our organization at Wright Field acts largely as a pooling and distribution agency. We are able to observe the various methods of tooling used on similar items spread geographically across the country, as well as study methods of tooling used in other industries not directly related to aircraft production. However, it is well to note that the Air Force is not creating basically new tooling concepts. In each case we are providing a means to evaluate various known methods of tooling. In final analysis, industry will select the tooling with Air Force guidance in the overall picture to best meet production needs. It is desirable to emphasize that it is the responsibility of industry to utilize the most efficient tooling available for the peak rate of production involved. We simply assist the producer in this production analysis.

At this stage of the overall problem it is not possible to anticipate definite results, nor can we endorse any method completely. It is hoped, however, that comprehensive reports based on sound industrial engineering practice will be available for distribution to all Air Force contractors. One interesting feature, however, is that it is quite probable that the tooling concepts will find far wider application than in aircraft production alone, therefore many outside organizations are keenly interested in the Air Force tooling projects.

The purpose of these investigations is to carefully control the cost, manpower, and time factors involved in the various tooling methods, compare one against the other under operating conditions, and recommend a means of standard tooling, if practical to do so.

From the standpoint of critical material shortages, even today we are faced with a serious curtailment of lead and zinc, the usual standard die materials which, in airframe production, answered many of our tooling needs. Because of this restriction on dies and tooling, we must now encourage airframe manufacturers to consider materials other than critical materials. This calls for ingenuity in utilizing plastics, gypsum-base materials, calcareous materials, or others in non-critical categories, by ingenious modifications of the Guerin process and stretch-forming operations.

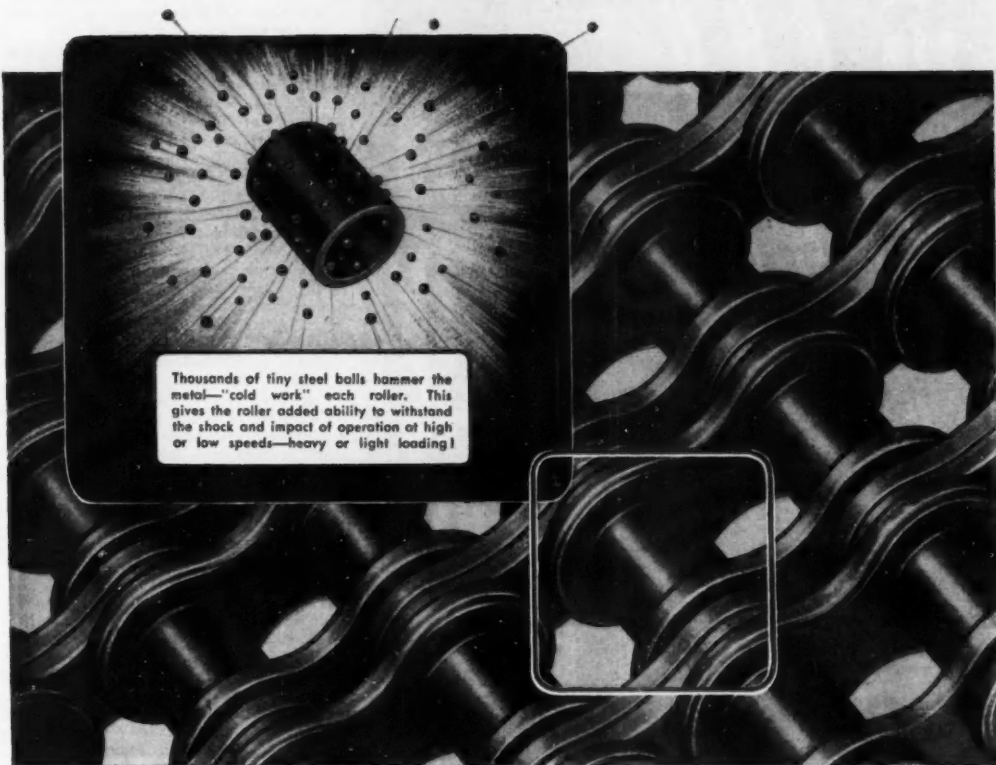
The die material situation is complicated by the increasing trend in the aircraft industry towards use of magnesium, titanium, stainless steel, or other alloys, which require heated dies in the forming and bending operations.

(Turn to page 132, please)

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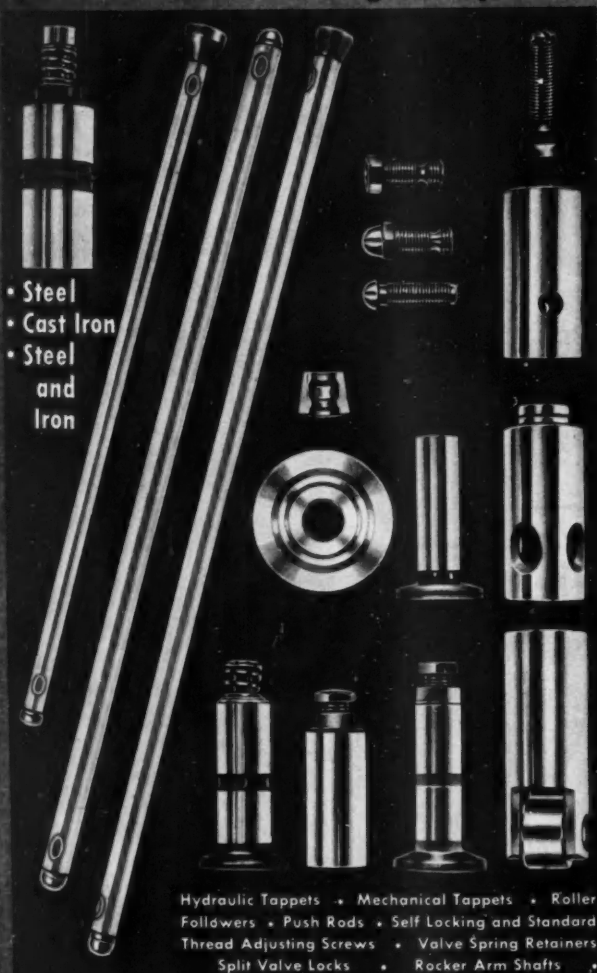
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Much can be done in this field of tool engineering, and it is perhaps one of the most critical production requirements confronting the Air Force. We are tooling up to utilize castings, forgings, powdered metal, rolled strip, extrusions, machined blades, and ground blades depending upon the design characteristics and functional requirements of the blades. Currently, there seems to be no easy, cheap, reliable method of tooling to make blades, irrespective of the basic method of production because of the close specification requirements. Here is a challenge to come up with a simple, inexpensive way to tool up for the high volume production demands to make jet engine blades. At present there seems no apparent solution to this critical item of production to meet engine production requirements.

In the field of jigs and fixtures, the Air Force has also been financing a number of tooling investigations for several years.

In any assembly tooling, the principal problem which confronts the engineer is to relate one or more points in space rapidly and accurately with reference to other established points. In large structures such as airframes it has been common practice to utilize the implements of the surveyor such as transits, levels, plumb bobs, rods and tapes, with ingenious combinations. This method has the recognized degree of
(Turn to page 134, please)

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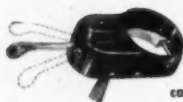


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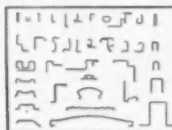
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human error, is time consuming and requires considerable skill. The methods vary with individual plants throughout the industry. The Air Force has recognized the inherent difficulty in continuing with this varying procedure and has encouraged investigations into possibly more efficient methods that are faster, more accurate and require less drain on highly skilled personnel and secure more controllable interchangeability.

The so-called German "hole production method" of tooling is currently being investigated. While this process is not new, and has been used on small assemblies in American industry for many years, it has not generally been applied to large structures such as airframes. Essentially, it is simple pre-drilling on a master body and, although it has many limitations, apparently it did provide Germany at the height of Allied bombing with a means of dispersed production, utilizing unskilled slave labor, and was capable of producing volumes of aircraft cheaply. The Air Force would like to know as much as possible about this method of tooling, and has two Air Force contractors performing a comprehensive production analysis of this system.

Another project we are interested in that appears to have promise is in the field of optical tooling.

Optical tooling utilizes a light beam as a standard of effecting alignment. Preliminary data seem to clearly indicate that it is a simplified and less costly means of building jigs and fixtures specifically for aircraft makers.

This system will work to an accuracy of 0.0015 in. in either a horizontal or vertical plane, almost irrespective of the distance involved. This method will enable the construction of jigs and fixtures, insuring absolute interchangeability without the use of 90 per cent of the master jigs normally required for coordination. It is believed that subcontractors at widely dispersed geographical areas, even though unfamiliar with aircraft production and its unique requirements, can construct necessary assembly fixtures from conventional drawings.

This system of tooling when used with some unique German cast members lends itself ideally to air transportation of large assembly fixtures in knocked-down units, if and when rapid portability or dispersal may be required. This method enables the technique to be used by less highly skilled personnel in considerably less time than some of the more conventional methods.

Both the German "hole method" and the optical method of tooling, besides enhancing the original production techniques, might alleviate the problems of the Battle-Area Maintenance Echelons, to which I referred earlier. Where formerly minor damaged aircraft parts and surfaces had to be replaced by hand-formed and hand-trimmed sec-

(Turn to page 136, please)

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tions, the interchangeability of both large and small sections envisioned by these methods will enable fewer men to replace more damaged parts in shorter time. Where major maintenance is required, a light portable version of the optical instruments will allow them to be used for the fabrication of sub-assemblies in areas heretofore not feasible.

The serious disadvantage of the current application of optical tools is that a positioning mechanism requires more floor space than is generally available under crowded assembly conditions. However, this can be overcome by planning for its use. When used as a jig-checking procedure, it is infinitely more rapid and accurate, and more easily accomplished than any other known method.

The Air Force is also financing an investigation of the coordinate setting machine, another form of optical tooling. Basically, the essential difference between the two is that the coordinate setting machine utilizes a line of sight independent of jig structures whereas the better-known optical positioner must maintain a line of sight on the structure. It is estimated that accuracy of the coordinate setting machine is in the order of 0.004 in. There are other important characteristics which will influence their application to aircraft construction. However, these are the primary differences.

Also, the Air Force is very much interested in electroforming as a method for tooling construction. This method of electro-depositing of material to minute tolerances enables the construction of super-accurate tooling required to construct ultra short wave length radio magnetic transparent radomes required for certain very critical radar equipment.

This short resume of aircraft tooling, which must be treated with a broad brush application for the short space allowed for this presentation, will show, however, that the Air Force believes that the basic expansibility factor and the key to mobilization is with the tool engineer.

Up to this point, I have confined my discussion to tooling as related to airframe and engine construction. Needless to say, there are a host of supporting items that make air power the potent weapon that it is. Not the least

(Turn to page 138, please)

Classified Advertisement

WANTED—An interested person or company to promote a new type of Patented Spark Plug which has been thoroughly tested. Will sell Patent rights outright or on Royalty basis. Can furnish copies of tests by a large responsible company. Address: H. R. Webber, 201 Leon Avenue, Norwood, Pa.



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An interesting story on standard and special industrial fasteners and their profitable applications to your needs may be obtained from experienced Theoll engineers. Ask these men to recommend screws, bolts and nuts that will increase your overall profits on assembly line work.

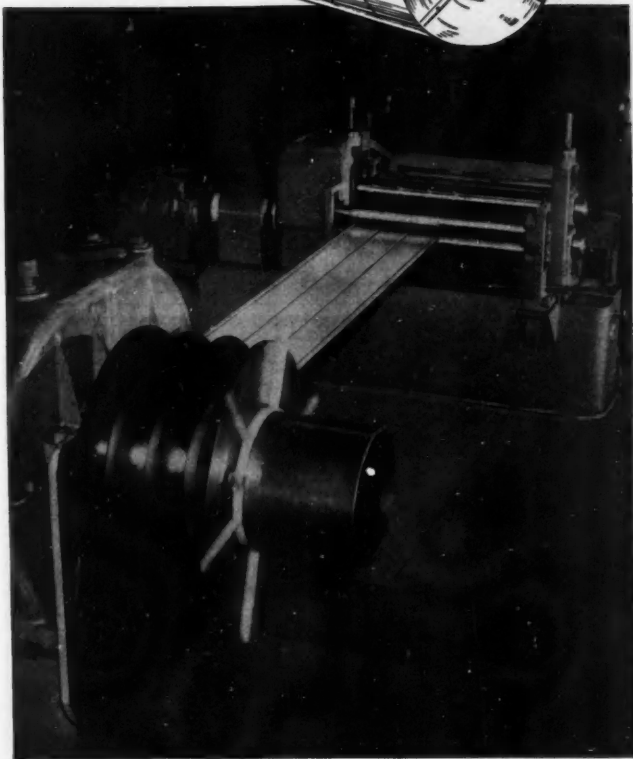
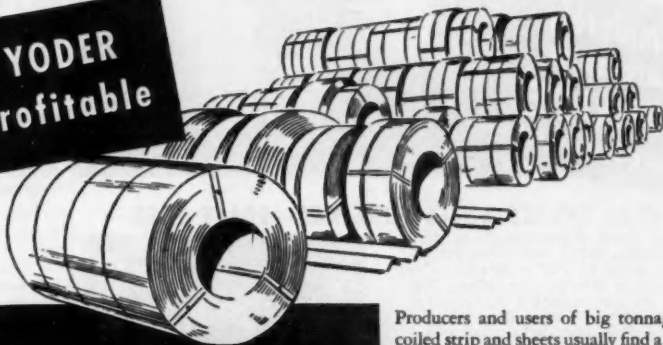
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The difference between the cost of standard widths and slit-to-width coil stock varies all the way from \$10.00 up to \$100.00 or more per ton, depending on width of strands, gauges and quantities. Even on annual requirements of less than 1000 tons, doing your own slitting may, therefore, pay very handsome dividends on the slitter investment. Equally important is the convenience of having your own slitter. Production planning is simplified and strip inventories may be reduced 50% or more by buying mill-edge stock in the required gauges, slitting it yourself to required widths when and as needed.

Yoder Uncoilers, Slitters and Recoilers have been standardized in a large number of sizes and capacities, from the smallest up. Investigate the economies of doing your own slitting with a Yoder line made up of units best suited to your requirements. Send for 76-page Yoder Slitter Book. It answers many questions as to choice of slitting units, production, first cost and operating cost.

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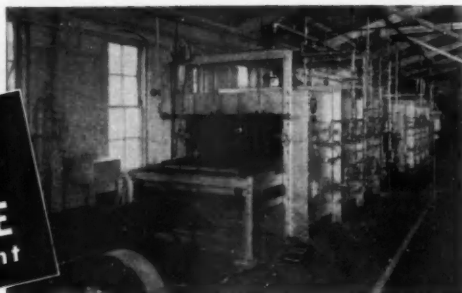
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of these items are those that are known as electronic components. I cannot think of another field in which the tool engineer can replace as many men with machines as he can in the field of electronics. To illustrate the magnitude of this field, the Air Force pays approximately \$900,000 for the electrical equipment installed in each B-36; this represents 25 per cent of the cost of the entire plane.

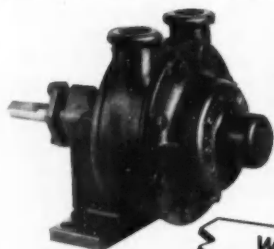
The reason why this equipment is so costly is that scores of men and women are used in the production lines of electronic component manufacturers, and testing and inspection procedures are long drawn-out processes.

Tubes used in home radio and television sets can be relatively fragile, non-uniform in life, and low-powered, for they are not jostled about. A repairman is a telephone call away, and reception covers but a few hundred miles.

With a tube fidelity of 3 per cent for the B-36 electrical equipment there could be 50 tubes out at one time, this means aborted missions. With proper tooling the fidelity might be reduced to 3/10 per cent and practically no aborts due to tube failure.

When a tube is consigned to a long-range bomber, however, it must be rugged; it must last as long as all other tubes in the ship; and it must be powerful. The reasons are obvious,

(Turn to page 140, please)



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Dependable pumps are a MUST for today's stepped-up production requirements.

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What makes an industry progressive?

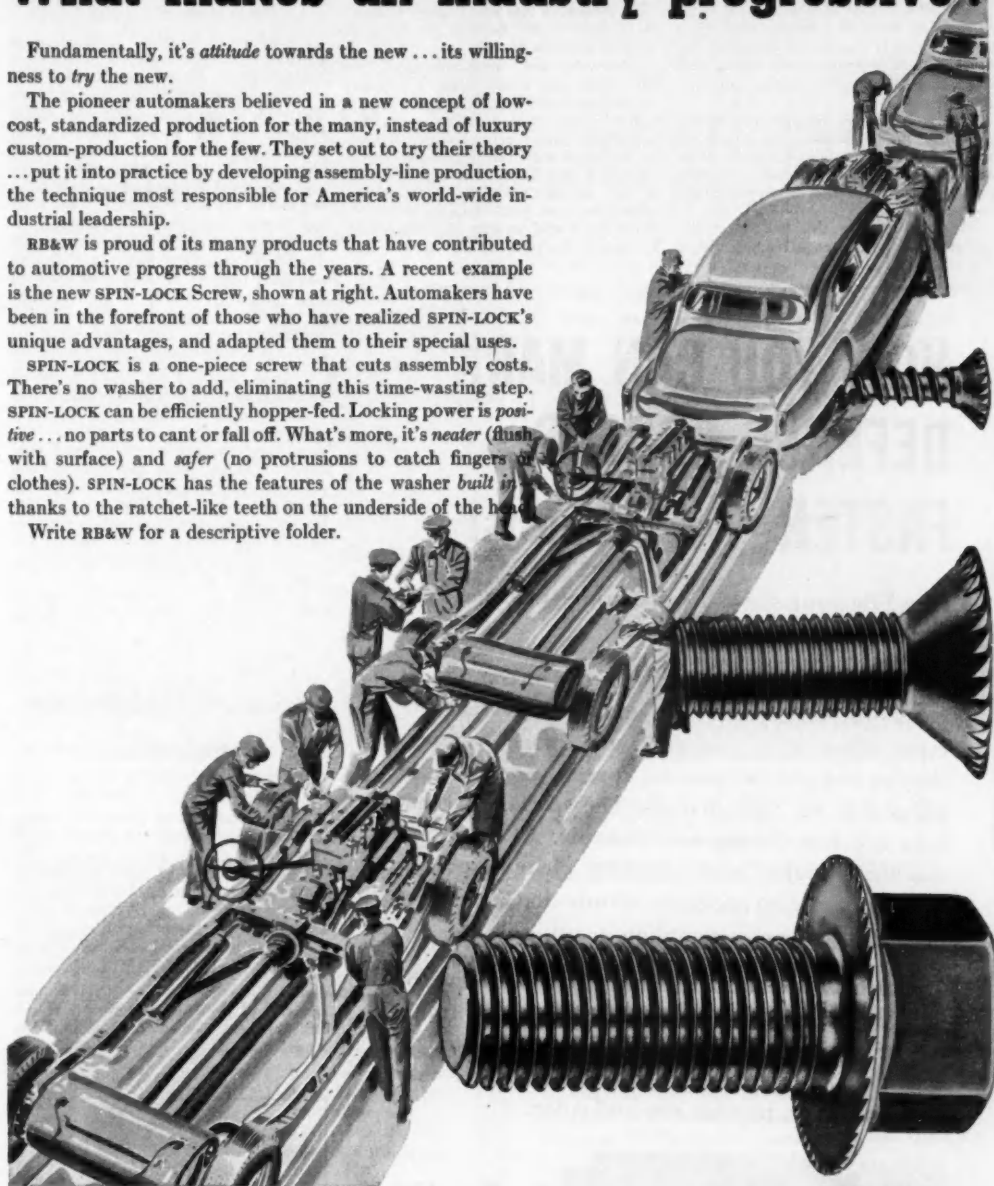
Fundamentally, it's *attitude* towards the new ... its willingness to *try* the new.

The pioneer automakers believed in a new concept of low-cost, standardized production for the many, instead of luxury custom-production for the few. They set out to try their theory ... put it into practice by developing assembly-line production, the technique most responsible for America's world-wide industrial leadership.

RB&W is proud of its many products that have contributed to automotive progress through the years. A recent example is the new SPIN-LOCK Screw, shown at right. Automakers have been in the forefront of those who have realized SPIN-LOCK's unique advantages, and adapted them to their special uses.

SPIN-LOCK is a one-piece screw that cuts assembly costs. There's no washer to add, eliminating this time-wasting step. SPIN-LOCK can be efficiently hopper-fed. Locking power is *positive* ... no parts to cant or fall off. What's more, it's *neater* (flush with surface) and *safer* (no protrusions to catch fingers or clothes). SPIN-LOCK has the features of the washer *built in*, thanks to the ratchet-like teeth on the underside of the head.

Write RB&W for a descriptive folder.



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106 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

AUTOMOTIVE INDUSTRIES, April 15, 1951

139

but the role of the tool engineer in this matter warrants some explanation. Ignoring, for this suggestion, the issue of cost, the United States can ill afford, in time of war, the demands on time and manpower made by the majority of the Air Force electronic items, and only the tool engineer can alleviate those demands.

Let me become specific by briefly sketching the evolution of an item from the time of its development until it is adopted as an article of war. The subject of this illustration is an electronic relay.

To make a relay that will meet the circuit and power requirements of a

particular radar or radio installation is not difficult. To develop the smallest and most rugged relay is also possible. (The Research and Development Group at Wright Field have a pretty good batting average to date.)

Following the development of the most desirable relay, from a military usage standpoint, the Air Force drafts a specification which demands that the applicable radar or radio installations be equipped with the new relay. Subsequently, Air Force contractors install in our airplanes radar or radio sets with maximum performance, and minimum space and weight characteristics. In theory, the procedure is that simple.

In practice, the maximum performance and minimum space and weight characteristics are bought at a price. That price is manpower.

Today, such a relay, if it could be produced at the rate of 160,000 a month (the Air Force needs that many), would tie up 600 people. An electronic component manufacturer has assured the Air Force, however, that proper special purpose tool and machine design (or in other words, the tool engineer), can eliminate the need for 500 of those 600 people. I am talking about operations like the one requiring 14 small welds in this relay. The Air Force cannot tolerate, during wartime, the use of men or women on that operation when it can be performed by a machine. Nor can the tool engineer, by the very nature of his profession, tolerate it.

I have expended not a few words to demonstrate to you that the Air Force is aware of, and vitally concerned with, the development of new tooling concepts, and the never-ending joint mission of the Air Force and tooling engineer to replace the man with the machine. I have touched only on airframes, engines and electronics, but the applications range from the largest bomber to the smallest jewel bearing.

The above is extracted from a speech by General Wolfe at the Annual Meeting of the American Society of Tool Engineers.

NOW YOU CAN MARK DEFENSE ORDERS FASTER—yet cut costs!

How? By putting a Markem marking machine right in your production line.

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New Hampshire

Don't miss the Markem exhibit, Booth 156, at the AMA Packaging Exhibition—
Atlantic City—April 17-20

McCulloch Tandem-Rotor Helicopter

(Continued from page 48)

Power is transmitted from the engine to a main drive shaft by means of 10 vee-belts. An idler pulley engages the drive shaft for flight, thus eliminating the need for a clutch. Drive from the main shaft to rotors is through right angle reduction gears carried in special light alloy housings at each rotor.

Production of the MC-4's will be handled by the newly-formed Helicopter Division of McCulloch Motors in a new building near the company's main Los Angeles plant.

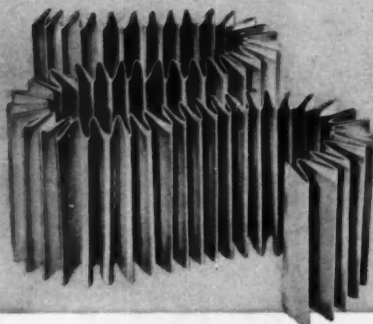
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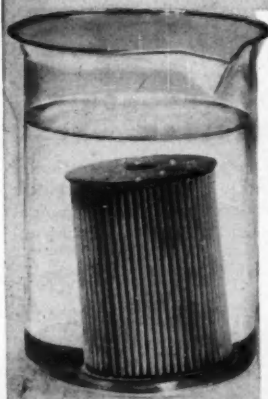
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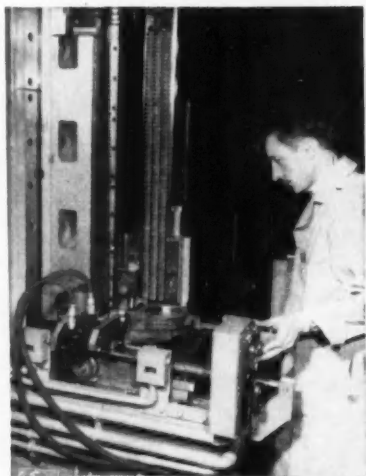
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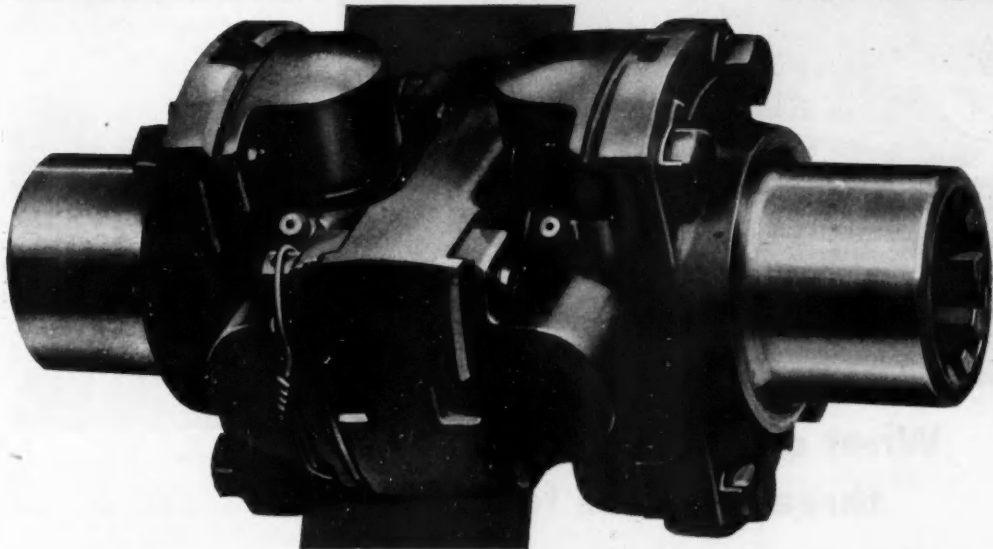


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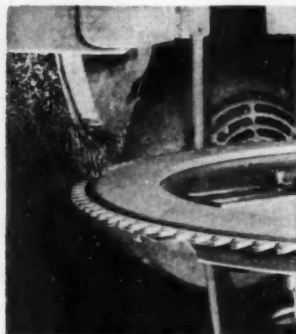
An Osborn Brushing Analyst will gladly study your product-finishing and cleaning operations to suggest ways to speed production and cut costs. Call or write *The Osborn Manufacturing Company, Dept. 433, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



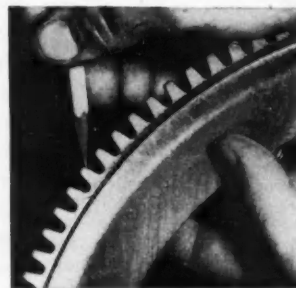
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THE MACHINE... a 5-head rotary automatic is used by this manufacturer to mechanize the brushing of clutch disc teeth. Each brush is powered by a 5 h.p. motor and rotates at 1750 r.p.m.



THE OPERATION. Four of the stations brush across the teeth like the one shown above. Fifth station brushes into the teeth.



THE RESULTS. Output is tripled. Manpower is conserved. Every disc is thoroughly and uniformly deburred. When clutches are assembled and tested, they operate smoothly and efficiently.

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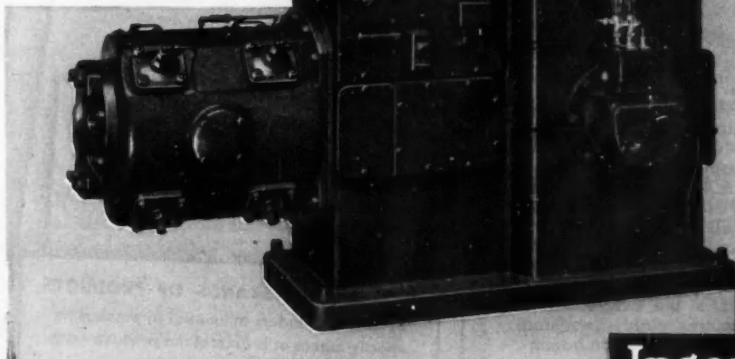
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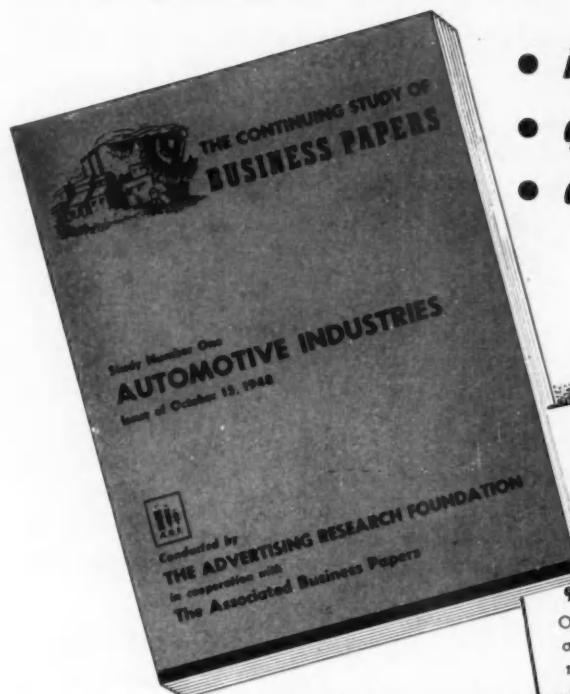
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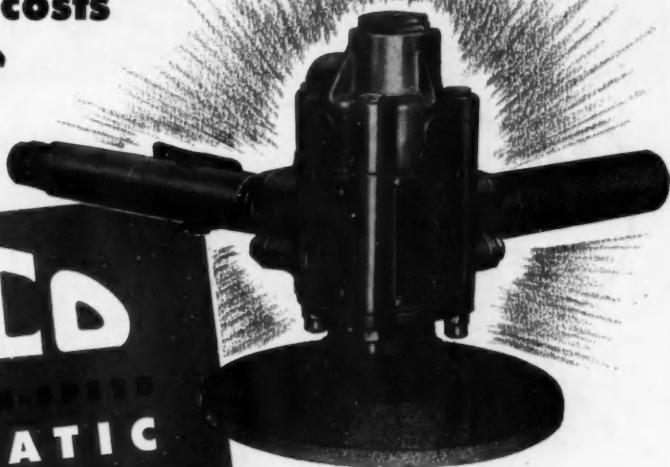
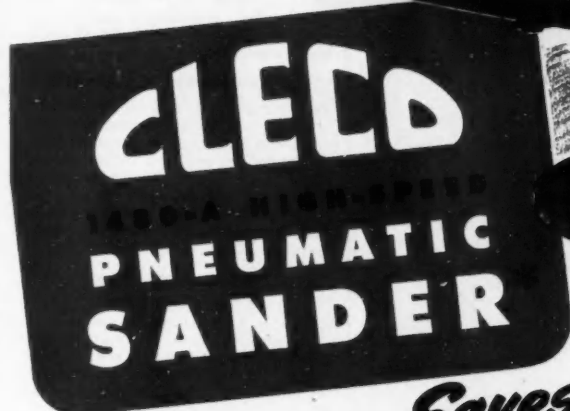
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● In chain hoists and other applications where loads are heavy and maintenance difficult, the high capacity and efficient self-lubrication of "COMPO" and "POWDIRON" result in long service life with little attention.



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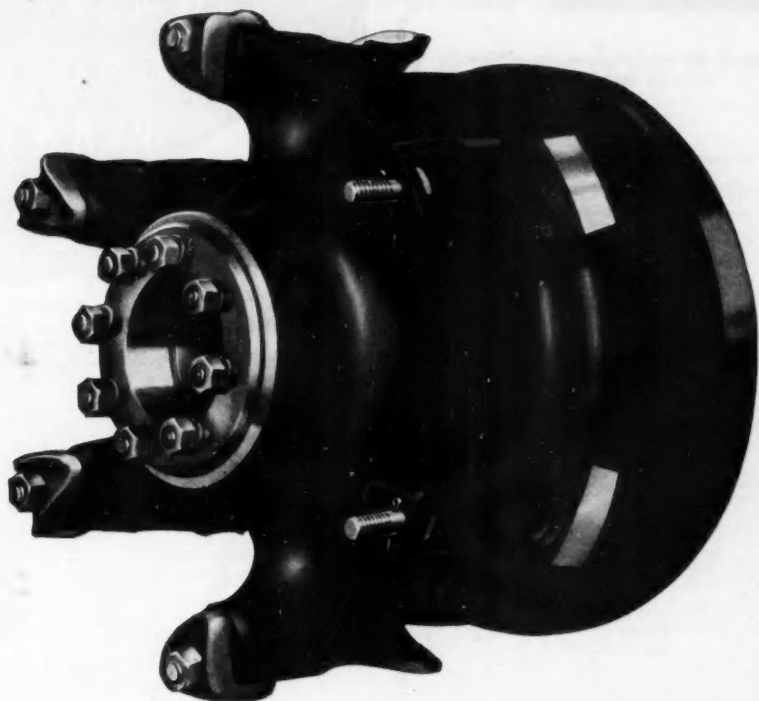
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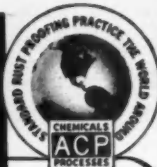
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FOR THE GOVERNMENT
AND ITS CONTRACTORS**



**PHOSPHATIZING, RUST, PROOFING AND PAINT
BONDING CHEMICALS**

Specification Number	ACP Specification Chemical
QQ-P-416	"Lithoform"
RR-C-82	"Zinodine"
MIL-C-5541 (See also QPL-5541-1)	"Lithoform" No. 32
MIL-S-5002	"Alodine"
JAN-C-490, Grade I	"Granodine"
JAN-F-499	"Granodine"
JAN-L-548	"Lithoform"
AN-E-19	"Permadrine"
AN-F-20	"Alodine"
	"Zinodine"
	"Alodine"
	"Granodine"
	"Lithoform"
	"Permadrine"
	"Thermol-Granodine"
	"Zinodine"
	(See also U. S. A. 3-213)
U. S. A. 57-0-2	
Type II, Class A	"Thermol-Granodine"
Type II, Class B	"Permadrine"
Type II, Class C	"Granodine"
U. S. A. 51-70-1	
Finish 22.02, Class A	"Thermol-Granodine"
Finish 22.02, Class B	"Permadrine"
Finish 22.02, Class C	"Granodine"
U. S. A. 50-60-1	"Alodine"
U. S. N. Avord O.S. 675	"Lithoform"
U. S. N. Appendix 6	"Permadrine"
Navy Aeronautical M-364	"Thermol-Granodine"
16E4 (Ships)	"Alodine"
	"Granodine"
	"Zinodine"
AN-C-170	(See MIL-C-5541)
U. S. A. 72-53	(See AN-F-20)
AXS-1245	(See JAN-C-490)

**RUST REMOVING AND METAL CONDITIONING
CHEMICALS**

Specification Number	ACP Specification Chemical
JAN-C-490, Grade II	
Type 4	"Deoxidine" Nos. 126, 512, 526, 624, 670
Type 5	"Deoxidine" Nos. 170, 171, 670
MIL-C-10578	
Type I	"Deoxidine" (Wash-off)
Type II	"Deoxidine" (Wipe-off)
U. S. A. 98-20007	"Deoxidine" No. 424
U. S. N. Appendix 6	"Deoxidine"
U. S. A. 3-213	(See MIL-C-10578)

METAL CLEANING CHEMICALS

Specification Number	ACP Specification Chemical
JAN-C-490 Grade II	
Type 2	"Ridoline"
Type 6	"Ridolol"
U. S. A. 3-192	"Ridoline" No. 3192

ACID INHIBITORS, PICKLING

Specification Number	ACP Specification Chemical
U. S. N. 51-1-2	"Rodine"

Additional copies of this chart and descriptive folders on the ACP Specification Chemicals listed above are available on request.

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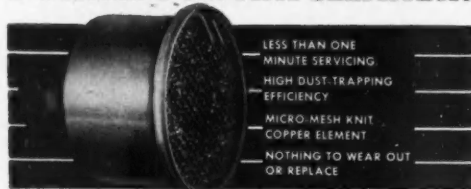
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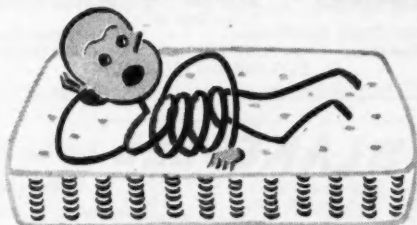
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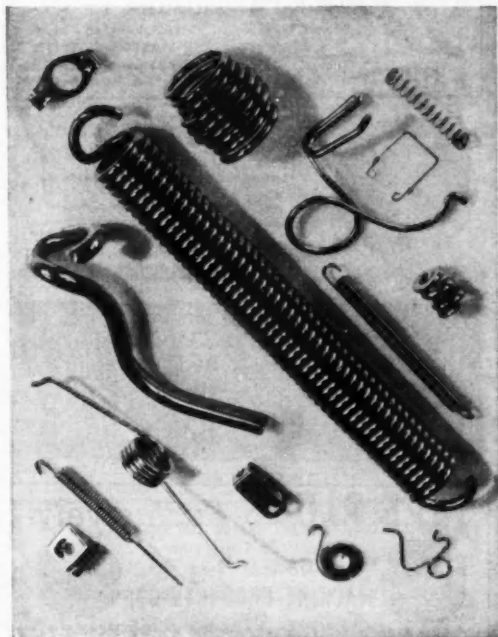


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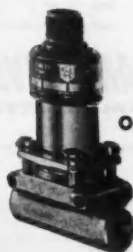


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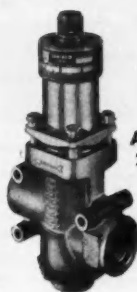
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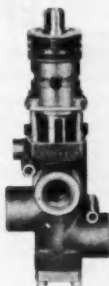
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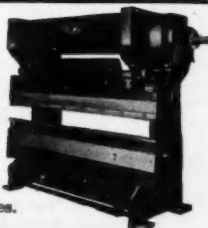
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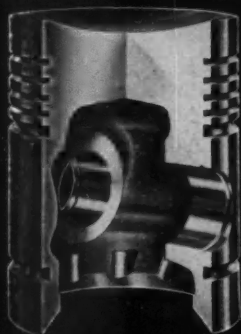
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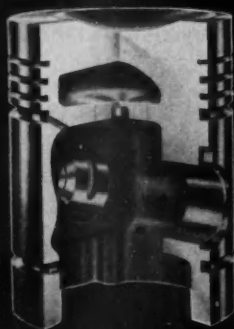
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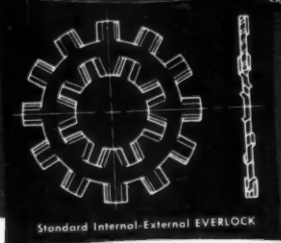
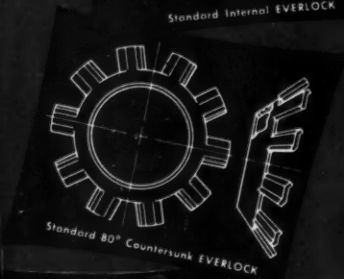
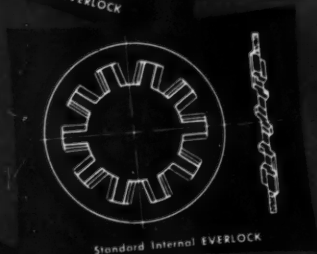
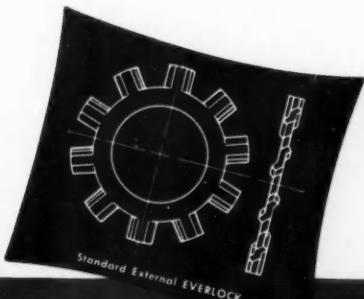
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